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30th Annual

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and

Instruction Seminar

August 25, 26, 27, 28, 29, 1952

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Hospitals, 43 Assistant Residencies and Residencies, 87

Name of Hospital	Location	Chief of Service	Inpatients Treated	Number of Treatments	First Year Residencies Offered*	Total Residencies Offered*	Beginning Stipend (Month)
UNITED STATES ARMY							
Letterman Army Hospital★	San Francisco	A. E. White	3,330	74,961	—	—	—
Fitzsimons Army Hospital★	Denver	H. B. Luscombe	19,402	258,912	1	4	—
Army Medical Center★	Washington, D. C.	J. H. Kuitert	6,785	263,456	2	5	.....
VETERANS ADMINISTRATION							
Veterans Admin. Hospital★[1]	Long Beach, Calif.	R. N. Nyquist	10,922	195,816	1	2	.....
†Veterans Admin. Hospital[1]	Fort Logan, Colo.	F. J. Fricke	907	36,326	—	—	.....
Veterans Admin. Hospital	Hines, Ill.	L. B. Newman	5,665	450,711	—	—	.....
Veterans Admin. Hospital[1]	Wadsworth, Kans.	L. Blau	3,169	192,760	—	—	.....
Veterans Admin. Hospital[1]	Framingham, Mass.	F. Friedland	7,000	210,000	1	3	.....
Veterans Admin. Hospital[1]	Jefferson Bks., Mo.	E. H. Weissenb'g	2,215	77,491	1	1	.....
Veterans Admin. Hospital[1]	New York City	A. S. Abramson	13,819	314,026	3	9	.....
Veterans Admin. Hospital[1]	Cleveland	H. T. Zankel	6,414	81,929	1	1	.....
†Veterans Admin. Hospital	Portland, Ore.	E. W. Fowlks	4,954	110,420	1	1	.....
†Veterans Admin. Hospital[1]	Aspinwall, Pa.	S. Machover	2,516	106,131	—	1	.....
Veterans Admin. Hospital★[1]	Houston, Tex.	B. L. Boynton	1,582	6,894	1	1	.....
NONFEDERAL							
Los Angeles County Hospital★[1]	Los Angeles	E. Austin	.....	91,836	—	1	165
White Memorial Hospital★	Los Angeles	F. B. Moor	195	.....	1	1	120
University of Colorado Medical Center							
Colorado General Hospital★[1]	Denver	H. L. Dinken	2,580	45,876	1	3	75
State of Connecticut Vet. Home & Hosp.	Rocky Hill, Conn.		.....	.....	3	3	.....
Emory University Hospital★	Emory Univ., Ga.	R. L. Bennett	1,719	10,473	1	1	50
Georgia Warm Springs Foundation	Warm Springs, Ga.	R. L. Bennett	973	104,401	1	3	250
Cook County Hospital★[1]	Chicago	D. Kobak	7,501	37,516	—	—	.....
Michael Reese Hospital★[1]	Chicago	C. O. Molander	2,254	19,589	1	1	25
Northwestern University Medical Center	Chicago		13,590	40,962	—	—	.....
Research and Educational Hospitals★[1]	Chicago	H. W. Kendell	5,688	11,769	1	3	55
University of Kansas Medical Center★[1]	Kansas City, Kans.	D. L. Rose	2,456	42,310	1	1	100
Massachusetts General Hospital★	Boston	A. L. Watkins	2,925	31,999	0	9	41.66
University Hospital★	Ann Arbor, Mich.		.....	.....	—	—	.....
University of Minnesota Hospital★[1]	Minneapolis	M. Knapp	20,409	29,436	4	4	—
Mayo Foundation	Rochester, Minn.	F. H. Krusen	.....	.....	2	6	135
Barnes Hospital★	St. Louis	S. Mead	9,759	9,759	0	1	.....
†Bellevue Hosp., Div. III, N. Y. Univ.★[1]	New York City	H. A. Rusk	4,058	116,705	—	7	80
Goldwater Memorial Hospital★	New York City	M. Dacso	733	50,706	1	2	80
Hospital for Joint Diseases★[1]	New York City	J. Weiss	.....	94,631	1	1	40
Hospital for Special Surgery	New York City	K. G. Hansson	20,806	40,810	'1	1	160
Mount Sinai Hospital★[1]	New York City	W. Bierman	11,942	36,970	1	1	50
New York City Hospital★[1]	New York City	F. K. Safford, Jr.	1,138	41,088	1	1	130
†Presbyterian Hospital★[1]	New York City	W. B. Snow	35,865	103,546	1	1	208
St. Luke's Hospital★[1]	New York City	R. Muller	900	98,954	1	1	60
†Rehabilitation Hospital	W. Haverstraw, N. Y.	M. Hoberman	5,868	408,371	1	1	225
Cleveland Clinic Hospital[1]	Cleveland	W. J. Zeiter	17,062	38,475	1	4	.....
Hospital of the University of Pa.★[1]	Philadelphia	G. M. Piersol	1,536	35,639	0	1	.....
Philadelphia General Hospital★[1]	Philadelphia	A. A. Martucci	2,827	23,733	1	1	75
Medical College of Virginia—Hosp. Div.★[1]	Richmond, Va.	W. J. Lee	4,575	40,327	—	—	46.50

The star (★) indicates hospital approved for intern training.
The dagger (†) indicates temporary approval.
[1] Residencies open to women.
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HISTORICAL NOTE

During recent years the view has been widely expressed that an International Congress of Physical Medicine should be held, and at the International Congress on Medical Electronics held in Brussels in 1948, it was suggested that London might be a suitable place for such an event. To this end the British Association of Physical Medicine was informally approached. The Council of this Association felt strongly that such an endeavor should be a regularly recurring event organized by a permanent international body, and undertook to foster the formation of such an international body.

As a preliminary step, the Interim Committee of the International Federation of Physical Medicine was set up in May, 1950, under the Chairmanship of Dr. Frank Krusen, Rochester, Minnesota, U. S. A., with Dr. Svend Clemmesen, Copenhagen, Denmark, as Vice-Chairman. This Interim Committee issued reports on its activities and drafted regulations which were circulated to national Associations of Physical Medicine, with the object of securing international support and the nomination of national representatives. As a result of this Committee's further efforts, membership of the Council for the Co-Ordination of International Congresses of Medical Sciences was secured. Having decided that the first Congress under its auspices would be held in London, the Committee invited the British Association of Physical Medicine, as the national association concerned, to appoint a small committee with powers to form an independent Board of Management responsible for the organization of an International Congress of Physical Medicine in 1952. At the Congress, which will be held in London, a meeting of the national representatives will be called and asked to form the International Committee of Physical Medicine.

EFFECTS OF SOME PHYSICAL THERAPIES ON BLOOD FLOW *

BARBARA F. RANDALL, Ph.D.
C. J. IMIG, Ph.D.
and
H. M. HINES, Ph.D.
IOWA CITY

Plethysmograph and thermal measurements have yielded much valuable information concerning the effects of various physical therapies on blood flow. These methods for estimating the volume blood flow have an advantage in that they can safely be applied to the human subject but are unsuitable, for the most part, for conditions which require continuous measurements of slow and rapid changes in blood flow in absolute rather than in relative units. In previous reports accounts have been given of the construction and use of an electromagnetic blood flow meter for measuring the volume blood flow through the vessels of laboratory animals.[1] This method, although it possesses a high degree of accuracy, unfortunately cannot be employed in studies on the human subject or in repeated studies on animals.

This study is concerned with the effects of several physical therapies on the volume blood flow through the hind extremities of adult dogs. The physical therapies employed were massage, passive stretching, electrical stimulation and the application of hot foments. Measurements of blood flow were made in the femoral artery of both anesthetized and unanesthetized dogs. The studies were made on normal, denervated and spastic limbs.

Experimental Method

The method for measuring the volume of blood flow through the femoral artery has been described previously.[1-2-3] In the experiments on unanesthetized animals, local infiltration of two per cent procaine hydrochloride was employed to prevent pain resulting from the exposure and cannulation of the artery. Some experiments were carried out under pentobarbital sodium anesthesia. Heparin was used as the anticoagulant in all experiments. Usually a period of from fifteen to thirty minutes was allowed to elapse after cannulation of a vessel for the establishment of steady states of blood flow in the control period.

Denervation was accomplished by severing both the sciatic and femoral nerves seven to fourteen days prior to study. Spasticity in the muscles was produced by a local injection of a standardized dose of tetanus toxin into the popliteal space of one limb.

Massage of the deep effleurage and petrissage types was applied to the hind limb of the dog by a physical therapist. A definite rhythm was established and the movements, primarily in a centripetal direction, followed the

* From the Department of Physiology, State University of Iowa.
* This work was aided by a grant from The National Foundation for Infantile Paralysis, Inc.
* Read at the Twenty-Ninth Annual Session of the American Congress of Physical Medicine, Denver, September 6, 1951.

1. Richardson, A. W.; Randall, J. E., and Hines, H. M.: A Newly Developed Electromagnetic Flow Meter, J. Lab. and Clin. Med. 34:1706 (Dec.) 1949.
2. Feucht, B. L.; Richardson, A. W., and Hines, H. M.: Effect of Hot Foments on Volume of Blood Flow in Extremities of Dogs, Arch. Phys. Med. 30:687 (Nov.) 1949.
3. Richardson, A. W.; Imig, C. J.; Feucht, B. L., and Hines, H. M.: The Relationship Between Deep Tissue Temperature and Blood Flow During Electromagnetic Irradiation, Arch. Phys. Med. 31:19 (Jan.) 1950.

pattern of the large muscle group in the leg. The massage was applied for a five-minute period. Volume blood flow was recorded before, during and for at least five minutes following the massage.

Three series of experiments were designed to demonstrate the effect of passive stretching upon the volume blood flow in the normal, spastic and denervated hind limbs of unanesthetized dogs. The stretching consisted of taking the gastrocnemius muscle through its full range of motion by flexing the foot upon the leg with the knee fixed in the extended position. Six excursions through the range of motion were used for each experiment. The range of motion was usually severely restricted in the animals with spastic limbs. The volume flow was recorded before, during and following the stretching period until the flow returned to or approached control level. The flows were analyzed at one-half-minute intervals and the average flow for the duration of the change was calculated.

The effect of electrical stimulation of muscle upon volume blood flow through the femoral artery was studied in dogs under anesthesia. Electrical stimuli were applied to the musculature of the leg in one of several ways. The first method used was the application of faradic current to the sciatic nerve using shielded electrodes. A second group had faradic current applied directly to the muscle through needle electrodes. A clinical stimulator furnished damped sinusoidal current oscillating at a rate of forty times per minute. The active muscle electrode was placed in the vicinity of the motor point of the gastrocnemius muscle and the dispersing electrode was held in place on the foot. Forty contractions were elicited per minute in a rhythmic pattern.

In a previous study[3] an investigation was made as to the effects of hot foment applications upon the volume blood flow in the extremities of anesthetized dogs. These studies have been extended and compared with those on unanesthetized animals. Experiments were carried out on normally innervated, denervated and spastic limbs. In addition, studies were made on normally innervated limbs which were treated with butyl aminobenzoate (Butesin^R) applied in the following manner: After the blood flow had leveled to control a three per cent solution of butyl aminobenzoate (Butesin^R) in sesame oil was painted on the shaved skin of the hind limb. After five minutes the excess was wiped off and a second application made. This procedure was repeated three times and at the end of the fifteen-minute period of control flow hot packs were applied. They consisted of a double thickness of munsingwear and were wrung from water at temperature ranging from 70 to 75 degrees C. The pack was then wrapped around the leg over the gastrocnemius muscle, and covered with oil silk and blanketing. A series of three hot packs were applied. The first and second packs were replaced after two minutes and the third was left in place for five minutes so that the total heating time was nine minutes. The temperature of the hot pack was measured by the insertion of a mercury thermometer into the pack. Temperature changes in the subcutaneous tissue were measured by means of an iron-constantan thermocouple needle[4] inserted into the desired position. The potentials were read every minute on a Leeds-Northrup potentiometer. Control values for blood flow were taken for fifteen minutes before the hot packs were applied. After removing the pack, the blood flow was followed until it returned to or approached control values whenever possible. When unanesthetized animals were used, the experiment had to be terminated five minutes after the re-

4. Tuttle, W. W., and Janney, C. D.: The Construction, Calibration, and Use of Thermocouples for Measuring Body Temperatures, Arch. Phys. Med. 29:416 (July) 1948.

moval of the third pack because of difficulties encountered in keeping the animals quiet for longer periods of time.

Results

The recordings of blood flow were made at two chart speeds. At fast speed, each vertical line represented 2.5 seconds and at slow speed; time was marked in minute intervals at the bottom of the records.

Chart 1 is a sample record showing the changes in volume blood flow produced during and following the five-minute period of deep stroking and

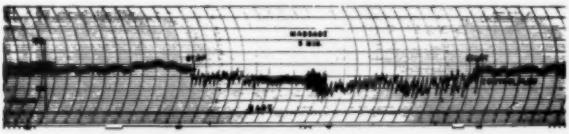

Chart 1. — Record showing effect upon volume blood flow of a five-minute period of deep stroking and kneading massage.

kneading massage. During the massage a slight decrease in the arterial volume blood flow was found. At the end of the period of massage, the flow returned to or increased slightly, but not significantly, above the control flow. Evidence presented indicates that massage of the deep effleurage and petrissage types has very little effect upon the volume blood flow in the femoral artery of dogs. The slight decrease found during the massage was probably related to a compression of the vessels from the massage movements. These results agreed essentially with those found by Wakim, et al.[5] In view of this it seems that the clinical improvement found in conditions for which massage has been shown to be beneficial must be due to some physiologic factor other than an increased blood flow.

A typical blood flow record obtained during and following the stretching of a normal limb can be seen in chart 2. During stretching there was some increase in volume blood flow. Immediately following the stretching the flow was markedly increased, reaching a maximum in about thirty seconds. The per cent changes in volume flow resulting from stretching normal, denervated and spastic limbs were compared graphically (chart 3) and analyzed statistically. Both spastic and normal limbs responded to the stretching with significant increases in the volume blood flow. The spastic limbs showed the greater increase although there was no statistical difference between these and the normals. The duration of the increases in the spastic extremities was three to seven minutes, whereas all the normals had returned to control at the end of three minutes. No significant changes in blood flow occurred when denervated limbs were stretched.

Faradic stimuli at a frequency of sixty per second produced similar effects upon blood flow regardless of whether they were applied to the nerve or directly to the muscle (charts 4 and 5). Immediately upon contraction the volume blood flow in the femoral artery was diminished and remained substantially below control until the stimulus was removed. At this time the flow was markedly increased above the resting level and only gradually returned to control levels. When muscle was activated by a clinical stimula-

5. Wakim, K. G.; Martin, G. M.; Terrier, J. C.; Elkins, E. C., and Krusen, F. H.: The Effects of Massage on the Circulation in Normal and Paralyzed Extremities, Arch. Phys. Med. 30:135 (March) 1949.

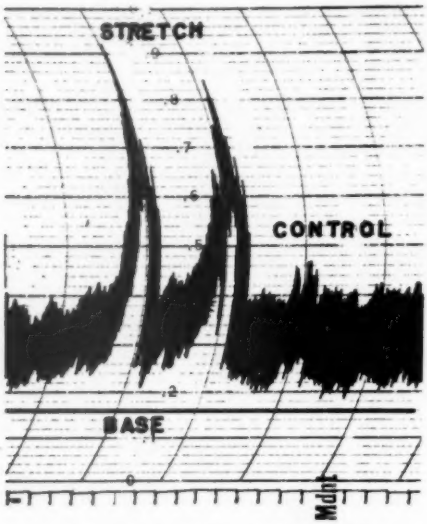

Chart 2. — Record showing changes in blood flow during and following passive stretching of a normal extremity.

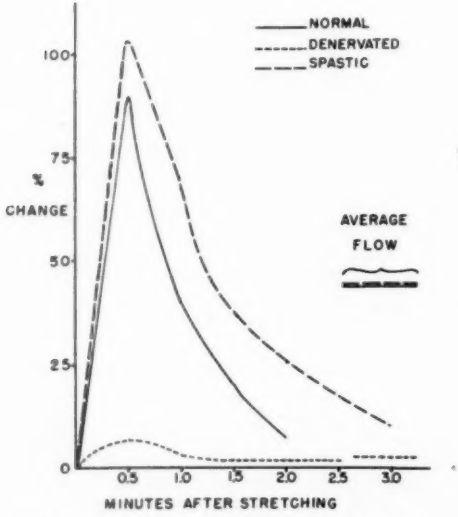

Chart 3. — Effect of passive stretching upon volume blood flow in the limb of dogs under various experimental conditions. Control flows were 62 cc./min. in normals, 56 cc./min. in spastic, and 49 cc./min. in denervated limbs.

tor which delivered stimuli in a rhythmic pattern at a frequency of forty per second there occurred a diminution of flow during contraction followed by augmentation during relaxation. After the stimulation was discontinued the flow gradually returned to the pre-stimulation level (chart 6).

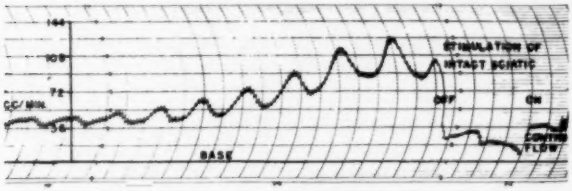

Chart 4. — Record showing changes in volume blood flow during and following indirect muscle stimulation through the nerve using faradic current and shielded electrodes.

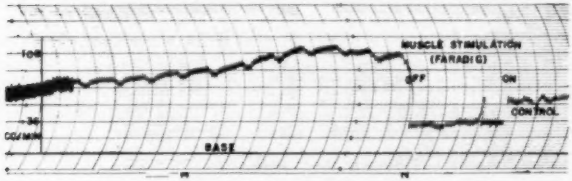

Chart 5. — Record showing changes in volume blood flow during and following direct muscle stimulation using faradic current and needle electrodes.

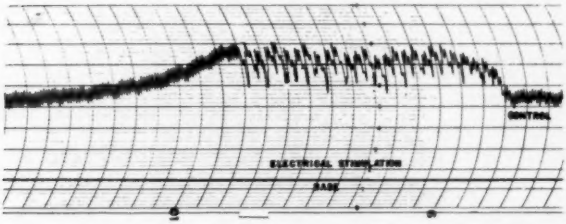

Chart 6. — Record showing changes in volume blood flow during and following rhythmic muscle stimulation using sinusoidal current pulsating at a rate of forty times per minute.

The results of the experiments in which a series of three consecutive hot packs were applied to the normally innervated, Butesin ® treated and denervated limbs of anesthetized and of unanesthetized animals together with their statistical analysis are presented in table I. In the experiments on normally innervated limbs of animals under anesthesia the volume blood flow increased gradually from the time the first hot pack was applied, the increase becoming significant at the end of three minutes. The maximum flow was attained between two and five minutes after the third pack had been

removed. Fifteen minutes after packing, the increases in blood flow were no longer significant although in some animals the flow did not return to control level for as long as forty minutes. The maximum average subcutaneous temperature increase was 8.7 degrees C., attained during the fifth minute of heating (table 2). After this the temperature gradually decreased, although the blood flow continued to increase for some time. The normally innervated limbs of unanesthetized animals showed no significant increases in blood flow during the packing. In the fifth minute following the removal of the third pack a significant increase in blood flow was observed. The average maximum increase in subcutaneous temperature was 5.5 degrees C. and occurred during the seventh minute of packing.

TABLE 1. — *Summary of Changes in Blood Flow During and Following Hot Packs.*

	Control cc./Min.	— Per Cent Change in Flow — Minutes During Packing 3	5	7	9	Minutes Following Packing 1	2	5	10	15
					A. Normally Innervated					
Anesthetized —										
Mean	43	+30	+41	+54	+60	+70	+73	+72	+48	+35
S. D.	.....	22	36	27	46	46	59	61	47	41
t	.....	3.6	3.1	5.2	3.5	4.0	3.3	3.1	2.8	2.1
Level of sig.	..	2	3	1	2	1	2	3	4	10
Unanesthetized —										
Mean	63	+3	+7	+3	+6	+9	+14	+18	....	....
S. D.	.....	8	14	18	18	18	19	17	....	....
t	.....	1.0	1.3	0.4	0.9	1.2	1.8	2.8	....	....
Level of sig.	..	40	20	80	50	30	20	4	....	....
					B. Butesin-Treated					
Anesthetized —										
Mean	36	—2	—3	+3	0	+4	+12	+17	+5	....
S. D.	.....	15	17	22	22	26	24	28	34	....
t	.....	0.3	0.5	0.3	0.0	0.4	1.4	1.6	0.4	....
Level of sig.	..	80	70	80	100	70	20	20	70	....
Unanesthetized —										
Mean	47	—7	—16	—11	—12	—12	—8	+3	....	....
S. D.	.....	15	15	15	19	19	19	21	....	....
t	.....	1.2	2.6	1.9	1.6	1.7	1.1	0.3	....	....
Level of sig.	..	30	5	10	20	20	40	80	....	....
					C. Denervated					
Anesthetized —										
Mean	32	+2	0	+16	+27	+34	+42	+45	+48	+44
S. D.	.....	12	17	22	35	24	21	14	22	37
t	.....	0.4	0.0	1.7	1.9	3.5	5.0	7.7	5.2	2.8
Level of sig.	..	80	100	20	20	2	1	0.1	1	4
Unanesthetized —										
Mean	44	0	+1	+6	+14	+21	+37	+40	....	....
S. D.	.....	4	4	7	10	15	23	23	....	....
t	.....	0.0	0.6	2.3	3.8	3.9	4.5	4.8	....	....
Level of sig.	..	100	60	10	1	1	1	0.1	....	....

The volume blood flow in the limbs to which Butesin[R] had been applied showed no consistent or significant increase either during or following the application of hot foments. This was true for the experiments on both unanesthetized and anesthetized animals. The thermal pattern of subcutaneous temperature changes in Butesin[R] treated limbs was not significantly different from that found in untreated limbs.

The response of volume blood flow in the denervated limbs to the application of hot foments was similar in anesthetized and unanesthetized animals. Both showed significant increases in volume blood flow at the end of the packing period. No difference was found between these two groups at any time during or following packing. The average increase in blood flow was greater in normally innervated than in denervated limbs of anesthetized animals. There was no significant difference in the blood flow changes due to the application of hot foments in the normally innervated limbs as compared with that of the denervated limbs of unanesthetized animals.

It was difficult to evaluate the effects of the application of hot foments upon the volume blood flow in spastic limbs. During the nine minutes of packing the animals were extremely restless, so that artifacts from movements of the limb were introduced. The first minute after the removal of

TABLE 2. — *Increases in Subcutaneous Temperature During and Following Hot Packs.*

	Control °C	Minutes During Packing 1 °C	3 °C	5 °C	7 °C	9 °C	Minutes Following Packing 1 °C	2 °C	5 °C	10 °C
A. Normally Innervated										
Anesthetized —										
Mean	35.8	5.2	7.6	8.7	7.9	7.1	3.3	2.3	1.0	1.0
S. D.		2.3	3.1	2.8	2.3	1.4	1.7	0.8	1.3	1.2
t		5.4	5.9	7.9	8.1	19.7	4.7	6.6	2.0	2.1
Level of sig.		1.0	1.0	0.1	0.1	0.1	1.0	1.0	20.0	20.0
Unanesthetized —										
Mean	38.2	2.4	4.1	5.4	5.5	5.0	1.8	0.9	0.8	0.4
S. D.		0.7	0.8	1.4	1.5	1.9	1.0	0.9	0.9	0.8
t		9.6	14.6	11.0	10.0	7.4	5.1	0.9	2.5	0.5
Level of sig.		0.1	0.1	0.1	0.1	0.1	1.0	40.0	5.0	80.0
B. Butesin-Treated										
Anesthetized —										
Mean	36.2	3.2	6.5	7.7	7.1	6.3	3.3	1.6	0.7	0.5
S. D.		2.1	3.6	3.3	2.5	2.7	1.8	1.6	1.6	1.6
t		4.2	3.6	4.5	4.5	4.9	3.6	3.1	0.9	0.6
Level of sig.		3.0	4.0	3.0	3.0	2.0	4.0	10.0	50.0	60.0
Unanesthetized —										
Mean	38.3	3.3	4.7	5.7	4.6	4.5	1.6	1.1	1.2	1.1
S. D.		1.3	1.1	1.5	1.7	1.6	1.0	1.0	0.9	1.2
t		7.5	10.9	11.0	7.9	7.9	13.3	4.0	2.6	2.6
Level of sig.		0.1	0.1	0.1	0.1	0.1	0.1	1.0	4.0	10.0
C. Denervated										
Anesthetized —										
Mean	36.9	4.2	7.3	7.9	7.2	5.6	1.9	0.8	0.6	0.9
S. D.		2.5	4.5	2.7	1.9	1.1	1.3	1.1	1.1	1.1
t		3.5	3.3	5.6	7.7	9.8	2.7	1.3	1.1	1.4
Level of sig.		5.0	5.0	2.0	1.0	0.1	10.0	30.0	40.0	30.0

the final pack there was a ten per cent increase in volume blood flow over the control, a value which was significant. However, this may have been due, at least in part, to the after effects of augmented muscular tone and contraction. The fact that general anesthesia abolished spasticity prevented the carrying out of experiments on anesthetized animals.

Comment

Caution must be exercised in interpreting the significances of changes in the volume flow through the femoral artery. The greater part but by no means all of the blood flow traverses the muscular structures of the limb. It is entirely possible that small but significant changes might occur, due to alterations in the flow through the skin without concomitant changes in

the deeper structures. The method employed yields accurate information concerning the total over-all flow and its changes but offers no information concerning its differential distribution between the several tissues supplied by a vessel.

The finding that passive stretching was effective for increasing the blood flow through normally innervated limbs but not through denervated limbs suggests that peripheral dilatation may result from the increased metabolism associated with exaggerated myotatic reflexes rather than from the physical effects of stretching per se. In this connection, it is pertinent to point out that massage techniques short of those involving some degree of stretching have been found to be ineffective measures for increasing blood flow.

In a previous study[3] it was found that the application of electromagnetic waves to a limb resulted in an increased blood flow only providing a certain critical temperature rise occurred in the muscles. Under the condition of our experiments deep tissue temperatures were seldom found to equal or excel this level. The observation that the application of hot packs caused an increase in blood flow in the limbs of anesthetized but not in the limbs of unanesthetized animals requires comment. The average control temperature in the subcutaneous tissue in anesthetized animals was 35.8 degrees C. and the average maximum temperature reached was 44.5 degrees C., or an increase of 8.7 degrees C. In the unanesthetized group the average control was 38.2 degrees C. and the maximum temperature reached averaged 43.7 degrees C., an increase of 5.5 degrees C. It may be assumed that a greater degree of initial vasoconstriction existed in the former than in the latter. The reaction to the application of hot foments is in part due to the direct effects of heat on the smooth muscle of blood vessels and in part due to reflex effects. The application of hot foments may serve as a noxious stimulus, eliciting a protective vasoconstrictor reflex. It is logical to assume that anesthesia may unequally affect the protective and heat-dissipating reflexes.

It is quite clear from numerous studies that it is possible to increase the blood flow through tissues by such measures as the application of heat, exercise, stretching and electrical stimulation. It is also apparent that the procedures effective for increasing blood flow increase the level of metabolic activity in the affected tissue. For instance, it has been found that a rise of 10 degrees C. serves to approximately double the rate of metabolism in tissue and that the oxygen requirements of muscle may increase several fold during exercise. Is the augmented blood flow resulting from the use of these physical therapies sufficient to meet the additional metabolic requirements imposed upon tissue by the therapeutic agents? It is quite possible that in many instances they may serve to aggravate rather than to improve the effective circulatory condition of tissue. Only when the net effects of blood flow changes upon oxygen and carbon dioxide tensions and glucose concentration in tissue have been determined will it be possible to evaluate the efficacy of such physical therapies.

Conclusions

The following conclusions are drawn as to the effects of several physical therapy measures upon the volume blood flow through the femoral artery of dogs:

1. Massage proved to be an inffective measure for increasing blood flow.
2. Passive stretching caused a significant increase in blood flow in normally innervated and spastic but not in denervated limbs.
3. Electrical stimulation of muscle results in an over-all increase in

blood flow. The flow was diminished during tetanic stimulation but increased during the post-stimulation period.

4. The consecutive application of three hot packs to normally innervated limbs of anesthetized animals resulted in an increased blood flow. The increase in flow was not observed when the hot packs were applied to limbs treated with Butesin[R]. The increase in flow was greater in normally innervated than in denervated limbs. The hot foment treatments caused no significant increases in femoral arterial blood flow in normally innervated limbs of unanesthetized animals. The flow was increased significantly in denervated limbs of unanesthetized dogs.

5. The question is discussed as to whether the increases in blood flow were able fully to compensate for the augmented metabolism resulting from increase in temperature and muscular activity.

Discussion

Dr. Herbert W. Park (Fishersville, Va.): I think we have heard a very interesting and timely paper concerning the various methods for increasing peripheral blood flow in physiological conditions and compared analysis of the findings. Since impairment of blood flow is one of the significant disorders we have to deal with in our practice of physical medicine, we should consider the results reported very carefully. As Dr. Hines indicated, in various surgical and drug techniques for increasing blood flow, there are certain untoward side effects and shortcomings which either limit their use or make them unfeasible for treatment. In order to apply adequately the information given, we as physicians must of necessity make proper selection of various methods of treatment on the basis of the condition being treated, with full knowledge of the action of the agents being employed. We would like to ask Dr. Hines some questions. 1. Can he answer the perennial question concerning methods of measuring under experimental conditions where only a sampling of blood flow can be done; in other words, has he any information concerning deep circulation as compared with the superficial? 2. From a clinical standpoint quite often we find that although certain results are obtained from animal experiments, their transfer to humans is not possible; we would like to know how well he feels his results can be applied to human physiological conditions. 3. From the physiological standpoint I would like to know his opinion as to which agents are most effective, taking into consideration the various side reactions and metabolic effect. 4. I would like to know if he has done any work in measuring blood flow in the denervated muscle, using medical stimulation. I think this work is very important as far as paraplegics are concerned; I see a great number of them and I know that quite a few in this group do, too. It would be interesting to have a little information regarding the effect of artificial stimulation of blood flow in denervated muscles.

Dr. Hines (closing): It is quite evident that the factors which affect the flow of lymph in the extremities are not necessarily the same for skin and for deep tissues. In some unpublished studies, we have shown that heat causes the usual responses in blood flow when the skin of the animal was removed and replaced with a paraffin coating. However, this is not true in all cases. Whether or not these same findings occur in humans is a matter of conjecture. We applied the same dosages and modes of administration to animals as have been recommended for human subjects. We have not as yet completed any work on denervated muscle.

STANDARDIZATION OF TECHNICAL TRAINING *

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In June, 1933, a resolution was presented to the House of Delegates of the American Medical Association requesting that plans be made for the establishment of standards, ratings and inspections of schools of occupational therapy. On recommendation of the Board of Trustees this resolution was referred to the Council on Physical Therapy (now the Council on Physical Medicine and Rehabilitation) and the Council on Medical Education and Hospitals for consideration and investigation. Under the direction of the Council on Medical Education and Hospitals 13 schools were visited in 1933-34 prior to the establishment of standards in cooperation with the American Occupational Therapy Association and the Council on Physical Therapy. These essentials were adopted by the House of Delegates in June, 1935, to be effective not later than January 1, 1939. The first list, published in 1938, contained the names of 5 approved schools in the United States, a number subsequently increased to 24.

Inspection and Standardization

A year after the introduction of the resolution on occupational therapy, the House of Delegates received a similar request in relation to the standardization and inspection of physical therapy schools. In this connection, the Board of Trustees reported to the House in 1934 that "The Council on Medical Education and Hospitals in cooperation with the Council on Physical Therapy is formulating essentials for physical therapy and occupational therapy schools." Within the next two years the Council on Medical Education and Hospitals completed a survey of 34 physical therapy schools and in August , 1936, published a list of 13 schools approved in accordance with standards adopted by the House of Delegates in May of the same year. These essentials were prepared by the Council on Medical Education and Hospitals in collaboration with the Council on Physical Therapy, the American Congress of Physical Therapy (now the American Congress of Physical Medicine) and the American Physiotherapy Association (now designated as the American Physical Therapy Association). Subsequent expansion of training courses in this field has increased the number of schools to 31.

The Council on Medical Education and Hospitals was also requested by the House of Delegates to undertake the standardization and approval of schools for laboratory technicians, schools for medical record librarians and schools for x-ray technicians. The initial list in medical technology contained the names of 96 approved schools, now expanded to 475. Standards were adopted in the medical record field in 1943, at which time a list of 10 approved schools was established; the present total is 19. In x-ray technique the Council's standards were formulated in 1944 and the following year a list of 112 approved schools was published; this has since increased to 292. In these fields, as in occupational therapy and physical therapy, the Council on Medical Education and Hospitals has received excellent cooperation from

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the allied medical and technical organizations. In medical technology the formulation of standards and the evaluation of individual schools have been accomplished in collaboration with the American Society of Clinical Pathologists, its Board of Registry and the Board of Schools of Medical Technology, which is currently cooperating in a survey of the approved laboratory schools. The x-ray field is represented by the American College of Radiology, the American Society of X-Ray Technicians and the American Registry of X-Ray Technicians. At present the American College of Radiology is cooperating with the Council in a comprehensive survey of all approved x-ray schools in which the inspection of individual training programs is carried out by the regional councilors of the College. In the training of record personnel, the American Association of Medical Record Librarians participates actively in the formulation of standards and in the evaluation of individual schools.

Under present standards of the Council approved medical schools may conduct acceptable courses in any or all of the technical fields; accredited colleges and universities may be approved in occupational therapy, physical therapy and medical record library science, while individual hospitals may receive approval in all fields except occupational therapy. Certain variations exist, however, in that approved hospitals are specified in physical therapy, (registered) hospitals in relation to medical technology, (registered) general hospitals in x-ray technique and both internship and residency approval when hospital record training is involved. State health laboratories affiliated with hospitals and x-ray departments affiliated with general hospitals are likewise eligible for approval in their respective areas.

Problems of Shortages in Facilities and Personnel

All of the technical fields are at the present time facing a serious problem in the continuing shortage of trained personnel. The approved occupational therapy schools reported 377 graduates last year, physical therapy 490, medical technology 2,011, x-ray technique 923 and the medical record field 83, all far short of the estimated requirements. In seeking the cause of these shortages many factors have been cited, such as the need for additional schools and further intensification of recruitment, the increasing competition with other fields, cost of education, inadequate economic returns, conditions of employment, attrition factors, lack of educational opportunities for male students in some areas, increasing entrance requirements, longer periods of training and the growing apprehension that in some fields the existing standards are already exceeding the bounds of practicability.

In physical therapy, a student is eligible for admission who has graduated from an accredited school of nursing or physical education or has completed two years of accredited college including satisfactory courses in biological and physical sciences. It should be noted, however, that only 7 of the 31 approved schools admit two year applicants, all others requiring three or four years of college except in the case of high school graduates entering a regular degree course or students accepted from schools of nursing or physical education. While the minimum requirement is 36 weeks, none of the approved civilian schools gives less than 12 months of training. Ten, not counting degree courses, offer more than 12 months and in 5 where two year applicants are accepted the training is of two years' duration. From this brief analysis it is apparent that physical therapy is now generally seeking a college level either through the establishment of three years prerequisite

education or in the development of a full four year degree course as now maintained in 11 schools.

The educational plan in occupational therapy follows the college pattern. In this field 21 of the 24 approved schools admit high school graduates for courses mainly of 5 years' duration. In addition, certificate courses are offered in 12 schools for degree students, who in practically all instances are given 18 months of training. Three schools admit two year applicants for a minimum of 27 months, while two accept one year college students with a required training period of four years. It follows, therefore, that training in occupational therapy is seldom completed until the student has been out of high school at least 5 years. This long period of training has been regarded in some quarters as a significant factor in the continuing shortage of occupational therapy personnel which has now reached a critical state. In seeking a solution to this problem it has been suggested that consideration be given to the establishment of hospital schools in occupational therapy with a clearer separation of those subjects that might profitably be shifted to a prerequisite level. At present the minimum college requirement is one year; the length of training is 100 weeks, including 39 of theoretical instruction, 25 of technical training and 36 of hospital practice.

In medical technology, where the minimum length of training is 12 months, the entrance requirements are listed at two years of accredited college including 12 semester hours of biology, 6 semester hours of inorganic chemistry and 3 semester hours of quantitative analysis, organic chemistry or biochemistry. The medical record field requires proficiency in typing and shorthand, also 2 years of accredited college or graduation from an accredited school of nursing. The minimum program is 50 weeks. Here it should be noted that college prerequisites are not included in relation to x-ray schools. In this field, admission requirements are based on the completion of four years of high school or graduation from an accredited school of nursing. The length of training is 12 months.

Continuing efforts are being made to increase the educational opportunities for technical personnel. The expansion of x-ray and laboratory schools has been particularly impressive, but progress has also been made in the other fields. The American Occupational Therapy Association and the American Physical Therapy Association, long active in the recruitment of students, have also worked diligently to help foster the establishment of new schools. In support of this program the Council on Physical Medicine and Rehabilitation recommended in December, 1950, that the Council on Medical Education and Hospitals encourage the development of recognized courses in physical therapy and occupational therapy in the teaching hospitals affiliated with medical schools. Acting on this request, the Council on Medical Education and Hospitals addressed a letter to each medical school calling attention to the need of further facilities for the training of physical therapists and occupational therapists. The subsequent replies have been encouraging; 17 medical schools, aside from the 18 already engaged in physical therapy training, have expressed their interest in the development of suitable programs. In occupational therapy, where 11 medical schools are already participating in technical training, there is indication that 13 additional medical colleges may wish to organize similar courses.

Necessity of Further Planning

Medicine's role in the standardization and production of technical personnel is also clearly evident in the interest and active cooperation displayed by allied medical organizations such as your Congress of Physical

Medicine and the Advisory Committee on Education. Many of these activities and responsibilities are likewise shared by individual physicians, particularly those who are directly associated with the training of medical and technical personnel. The physiatrist in his relation to individual schools has not only the opportunity of leadership and active participation in teaching, but also the added responsibility associated with the organization of educational programs. He should, therefore, be directly concerned in curriculum planning, length of training, entrance requirements and other factors important in the procurement and training of technical personnel. In the broader field of medical education his services are likewise essential for the training of young physicians required to meet the expanding needs in physical medicine.

In the fields of physical therapy and occupational therapy much has been accomplished — yet there are many problems still pressing for early consideration. Included in these is need for additional information on the available supply of technical personnel so that more accurate knowledge may be at hand in considering shortages, recruitment, and further expansion of training. Based on this knowledge, effective planning may be instituted to alleviate existing shortages and insure a more adequate supply of technical personnel in relation to future needs. Consideration must also be given to the mounting requirements imposed by individual schools or by policies developed within the technical fields. If such requirements become excessive or if it is found that an adequate supply of technical personnel cannot be produced under present methods and facilities, it may become necessary to modify the existing pattern or depend in increasing degree on the development of subsidiary groups of junior technicians. Continued efforts should be made, however, to increase the opportunities for training, including the possible development of hospital schools in occupational therapy to help overcome the critical shortage in this field. In this connection, it is urged that closer liaisons be established between the technical organizations and the corresponding medical groups so that in a full spirit of understanding the problems of the future may be worked out in the best interest of the public welfare.

EFFECT OF PROGRESSIVE RESISTANCE EXERCISE ON MUSCLE CONTRACTION TIME *

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The rapid clinical development of therapeutic applications of Progressive Resistance Exercise[1-2-3] has far outstripped studies of the physiological responses to them. Basic knowledge of the physiological effects of Progressive Resistance Exercise must be obtained so that questions such as its effect upon muscle bulk, speed of muscle contraction, etc., can be answered. Research by several investigators[3-4] has already begun to add to our understanding of these matters. This preliminary report discusses an exploratory effort to evaluate the influence of Progressive Resistance Exercise on muscle contraction time, and describes the method and apparatus used and some of the difficulties encountered in studies of this nature.

The question as to whether Progressive Resistance Exercise, when used according to clinical practice, produces lengthening of contraction time is of significance to athletes, typists, dancers and others whose efficient performance is dependent upon rapid movement. It is also of interest to trainers and to coaches of athletes in connection with such beliefs as that heavy exercise "slows down," "throws timing off," and makes athletes "muscle bound." Following intensive Progressive Resistance Exercise muscle fibers do hypertrophy, and it is conceivable that concomitant changes may occur in the muscles' viscosity which would alter the contraction time.

Method

Two joint actions, elbow flexion and knee extension, were studied. These were selected because they satisfactorily lend themselves to both the techniques of Progressive Resistance Exercise and to contraction time testing. Ten adolescent boys were chosen for study: five served as controls, five acted as exercise subjects. The control group received no Progressive Resistance Exercise, but its members were tested in the same manner and at the same time intervals as the exercise group. The exercise group was given Progressive Resistance Exercise four times weekly: an intervening school vacation period reduced their average number of workouts to about forty for the four months' experimental period.

The apparatus for testing elbow flexion consisted of a special chair in which the subject sat with the right upper arm supported along the posterior portion by a board (figures 1a and 1b). The ipsilateral shoulder was strapped to the back of the chair so that there would be no shoulder or trunk movement on biceps contraction. The forearm was in partial extension, with the

* This study was supported by funds from The Grant Foundation, Inc.

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1. De Lorme, Thomas L.: Restoration of Muscle Power by Heavy-Resistance Exercises, J. Bone & Joint Surg. 27:645 (Oct.) 1945.

2. Gallagher, J. Roswell and, De Lorme, Thomas L.: The Use of the Technique of Progressive Resistance Exercise in Adolescence, Jour. Bone & Joint Surg., Vol. 31-A, No. 4, 847 (Oct.) 1949.

3. De Lorme, Thomas L., and Watkins, Arthur L.: Progressive Resistance Exercise: Technique and Medical Application, Appleton-Century-Crofts, Inc., 246 Pages, New York 1951.

4. Houtz, S. J.; Parrish, A. M., and Hellebrandt, F. A.: The Influence of Heavy Resistance Exercise on Strength, Physiotherapy Rev. 26:290, 1946.

ulnar aspect of the closed fist pressing a small button which operated the switch to the electric timer. The circuit of the electric timer was broken by pressure on this button so that the action of the timer was suspended until the test was ready to be performed. From this starting position the arm was flexed with as much speed as possible; and instantaneously with the initiation of elbow flexion, pressure was released from the button, making the circuit and starting the clock. No starting signals were employed, since measurement of reaction time was not the purpose of the study. The subject initiated the contraction at will. As the arm progressed upward it struck a rod, breaking the circuit and stopping the clock. Thus the time interval required to complete the arc of motion was measured.

Fig. 1a.

Fig. 1b.

Fig. 1a and 1b. — A — Switch for initiating recording by electric timer. Timer starts when hand removed from this switch. B — Pilot light which turns on when contact is made with switch A. C — Bar which controls switch for stopping timer. When bar is struck by hand, timer stops. D — Electric timer. E — Strap for keeping arm fixed to chair in constant position.

The timer used was an electric clock calibrated in and accurate to within 1/100ths of a second. Another feature of this timer is the DC clutch incorporated within it, making possible instantaneous responses to makes and breaks in the circuit.

To measure the speed of quadriceps contraction time a similar apparatus was constructed so that the patient sat on a table with a strap placed over the upper leg to prevent upward motion of the thigh itself (figures 2a and 2b). The body was supported by the hands extended posteriorly, with the hips in semiflexion of about a sixty-degree angle with this body. The heel was pressed firmly against a button which disengaged the electrical circuit. Then the foot was brought up sharply by contraction of the quidriceps alone. Another rod, similar to the one used in the arm procedure, was struck, the circuit broken, and the time interval measured with the same electrical timer in 1/100ths of a second.

A series of preliminary trials (consisting of approximately ten successive contractions) was performed on several days by each of the ten subjects. During this two-week preliminary period each subject's contraction time

became more constant. However, since there was some degree of individual variation, the number of contractions performed per day ranged from ten to eighteen.

Each subject's 1 R. M. (the one-repetition maximum or the most weight that can be correctly carried through a full arc of motion once) was determined for the biceps, the knee extension and the hip-knee extension exercise.[1-2-3] Since motor learning produces a considerable increase in 1 R. M. during the first week of exercise, the 1 R. M. obtained at the beginning of the second exercise week is used as the initial strength index. This 1 R. M. was used as the basis for each subject's progressive resistance exercise prescription, was re-checked weekly, and as it increased a new prescription was written so that the muscles were always working against approximately the maximum resistance possible for them to overcome.

Fig. 2a.

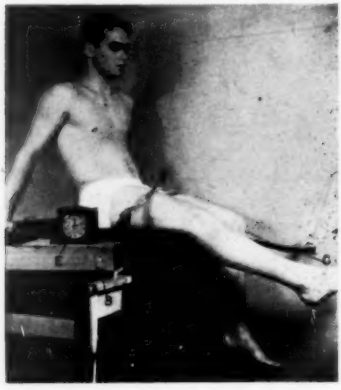

Fig. 2b.

Fig. 2a and 2b. — A — Switch initiating recording by electric timer. Timer starts when foot is removed from switch. B — Pilot light which turns on when contact is made with switch A. C — Bar which controls switch for stopping timer; when bar is struck by foot, timer stops. D — Strap for keeping thigh fixed to table. E — Electric timer.

Data and Discussion

Muscle Hypertrophy and Strength. — Measurement of muscle hypertrophy under laboratory conditions is far from easy, and under the limitations imposed by clinical conditions the task is even more difficult. In this study circumferential upper arm and thigh measurements were made as carefully as possible at the beginning and at the end of the experimental period. The thigh was measured in full extension at a given distance above the patella; the upper arm was measured both flexed and extended at its point of greatest diameter (table 1). The only purpose of these measurements was to determine whether change in limb diameter occurred during the exercise period. A significant increase in these diameters in the exercise subjects, in the absence of any change in the control subjects' measurements, would seem to constitute evidence of increase in muscle mass.

TABLE 1. — *Changes in Biceps and Quadriceps Circumference During the Experimental Period in Both the Group Which Exercised Those Muscles and in the Control Group Which Did No PRE.*

Subject	Number of Workouts	Increase in Arm Circumference		Increase in Arm Circumference Upon Flexion		Change in Thigh Circumference Inches
		Relaxed Inches	Contracted Inches	Before PRE Inches	After PRE Inches	
L. C.	31	¼	¼	1¾	1½	Plus ¾
A. D.	41	0	⅛	1	1¼	Plus ½
R. E.	35	¼	½	1	1½	Plus ½
F. R.	39	¼	⅞	1½	2⅛	Plus 1¾
E. C.	42	½	¾	1⅛	1½	Plus ¾
I. M.	0	¾	½	.....	.....	0
N. R.	0	0	0	1	1	Minus ⅛
R. P.	0	0	¾	1¼	1½	0
G. S.	0	0	0	1	1	0
C. W.	0	0	¼	1¾	1½	0

The data in table 1 have to be evaluated with the fact in mind that the measurement method used is not a precise one. However, it seems fair to say that the exercise subjects showed an increase in limb circumference, whereas the control subjects showed little, if any, difference between their initial and final measurements. Four of the five exercise subjects showed an increase of from ¼ to ½ inch in their relaxed arm circumference, while only one of the controls showed any gain. All of the subjects who exercised showed an increase of from ¼ to ⅞ inch in their contracted arm circumference (mean, ½ inch) whereas in only three of the controls was there an increase, and the mean of these was less than ¼ inch. At the end of the experimental period all those who had done progressive resistance exercise showed a greater difference between their arm circumference when measured at rest and then in contraction than had been present initially. (The mean increase was ⅜ inch.) During this same period only two of the controls showed any increase, (¼ inch).

The thigh measurements (table 1) show an increase in circumference of from ½ inch to 1¾ inches (mean, approximately ⅞ inch) for all members of the exercise group, whereas no member of the control group showed an increase. In spite of the inaccuracies of the measurement method it seems reasonable to conclude that the progressive resistance exercise produced an increase in these subjects' muscle mass.

Strength was measured in terms of the 1 R. M. This is a crude test of muscle strength; but in normal subjects in whom it is desired only to determine gross strength, it is adequate. There was no increase in the 1 R. M. for any of the exercises by any member of the control group. Increases of from 50 per cent to 71 per cent (mean, 59 per cent) were produced by biceps exercise, of from 28 per cent to 70 per cent by knee-extension exercise (mean, 49 per cent) and of from 23 per cent to 60 per cent by hip-knee extension exercise (mean, 42 per cent). No subject in the exercise group failed to increase his 1 R. M. in any of the three exercises; the smallest increase in 1 R. M. was 23 per cent (table 2). When muscle size, as well as muscle strength, is found to have increased, it can be assumed that strength has increased on a structural basis and is not due to motor learning alone.

Soft tissue x-rays of both the right and left biceps were made before and after the exercise period. However, despite careful efforts in positioning each subject, it was subsequently found that differences in elbow flexion from two to ten degrees existed between initial and final films. Since the

TABLE 2. — *The Per Cent Increase in 1 R.M. for Each of the Subjects Who Exercised Their Biceps and Quadriceps. None of the Control Subjects Showed Any Increase in 1 R.M.*

Subject	Number of Workouts	Per Cent Increase in 1 R. M.		
		Biceps	Knee Extension	Hip-Knee Extension
L. C.	31	50	61	40
A. D.	41	63	44	52
R. E.	35	71	70	36
E. R.	39	65	44	60
E. C.	42	50	28	23

mean arm circumference increased about 1.25 inches from 180 degrees extension to 90 degrees of flexion, measurements taken from other than perfectly positioned x-rays could be of little significance, particularly when the differences between initial and final x-ray measurements were as small as was the case here. These data allow no more than the comment that the x-rays reveal no reliable evidence of increase in biceps diameter in either of the groups.

Contraction Time. — Table 3 lists the elbow-flexion contraction time (in

TABLE 3. — *Elbow-Flexion Contraction Times (in Hundredths of a Second) of Each Member of Both the Control and the Exercise Groups.*

		ELBOW FLEXION										
Subject		Controls					Exercised Group					
		1	2	3	4	5	6	7	8	9	10	
	10								12.2			
	9		14.1						11.4			
	8		11.6		12.5	12.7	10.8	12.2	10.1		12.7	
	7		12.2		12.2	13.5	11.7	12.0	10.2		13.5	
	6		11.7	12.1	13.0	12.1	11.2	11.5	9.3	10.2	12.1	
Trial												Pre-exercise
Number	5	11.3	11.9	11.7	12.6	11.5	10.7	11.1	10.8	10.3	11.5	Period
	4	11.8	11.3	10.9	11.3	11.9	10.8	11.1	11.5	9.7	11.9	
	3	11.4	13.3	11.3	10.7	10.9	11.0	11.7	11.2	9.5	10.9	
	2	10.2	11.8	11.2	11.3	10.5	11.2	11.7	11.0	10.3	10.5	
	1	11.0	12.0	11.2	10.9	11.7	10.7	11.8	11.6	9.7	11.7	
11.8*		11.1	12.2	11.4	11.8	11.9	11.0	11.6	10.9	10.0	11.9	11.1*
	1	11.1	12.5	11.3	11.4	12.8	11.9	11.2	11.7	10.5	11.6	
	2	10.7	12.6	11.8	11.8	11.6	10.1	11.5	11.0	11.0	10.4	
	3	11.1	13.4	11.6	12.8	12.3	11.6	12.0	12.5	10.8	11.7	
	4	11.1	11.6	11.8	10.5	11.4	11.5	11.0	10.8	10.2	11.2	
Trial												Post-exercise
Number	5	10.8	12.3	11.3	11.8	11.3	12.5	10.9	11.8	10.1		Period
	6		13.0	11.2		11.7		11.2	11.3			
	7							10.3				
	8							11.0				
11.7*		11.0	12.6	11.5	11.7	11.9	11.5	11.1	11.5	10.5	11.2	11.2*

* These averages and all times are in hundredths of a second.

hundredths of a second) for each of the five subjects who exercised their biceps and for each of the five controls. Each of the ten subjects was tested in the manner shown in figures 1a and 1b on from five to ten different days both before and after the four month exercise period. The mean contraction time of elbow-flexion for the five subjects was almost identical for the pre-exercise and the post exercise period: eleven and one-tenth hundredths of a second for the former and 11.2 hundredths of a second for the latter. The control group, which did no exercise, also showed no difference in the mean

contraction times, that for the pre-exercise period 11.8 hundredths of a second and for the post-exercise period, 11.7 hundredths of a second. Most of the subjects of both groups showed different mean contraction times in the post exercise period; this, however, did not affect the statistical stability of the data, for these differences were small (only 1 exceeded 0.6 hundredths of a second) and varied in both directions, some contraction times being longer after the exercise bout and others shorter.

Table 4 lists similar data for knee extension contraction time. Both the exercise and the control group showed a significant decrease in knee-extension mean contraction time from the pre-exercise to the post-exercise period. The decrease in mean contraction time was slightly greater, though not significantly so, for the exercise group (2.2 hundredths of a second) than for the control group (1.6 hundredths of a second). All members of both the control and the exercise group showed a reduction in contraction time and in all probability this was due to some undetected alteration in technique or apparatus. Since, however, all subjects of both groups were subjected to this factor the validity of the data is not destroyed.

TABLE 4. — *Knee-Extension Contraction Times (in Hundreths of a Second) of Each Member of Both the Control and the Exercise Groups.*

		KNEE EXTENSION										
		Controls					Exercised Group					
Subject		1	2	3	4	5	6	7	8	9	10	
	10								15.6			
	9		15.7				14.8		15.1			
	8		15.4		15.3	15.5	16.4	14.2	15.3		17.1	
	7		15.4		16.6	16.8	14.9	14.5	14.5		16.4	
	6		15.3	14.7	16.1	15.8	14.8	13.3	16.1	13.6	15.8	
Trial												Pre-exercise
Number	5	15.6	15.7	14.5	16.1	14.5	14.2	13.0	13.0	13.7	15.5	Period
	4	14.6	14.7	14.4	14.5	15.0	14.2	13.2	14.4	15.6	14.9	
	3	13.9	15.1	14.5	14.0	13.6	13.7	13.2	15.7	13.4	14.9	
	2	13.9	14.5	15.6	14.6	14.7	13.1	12.2	14.9	13.4	14.5	
	1	14.0	15.3	14.8	15.0	14.8	14.3	13.3	16.6	13.9	14.4	
15.0*		14.4	15.2	14.8	15.3	15.1	14.5	13.4	15.1	13.9	15.4	14.5*
	1	13.2	12.9	13.9	13.7	14.8	11.6	12.1	13.2	12.2	12.4	
	2	13.8	12.3	13.4	12.6	13.2	12.1	12.0	12.0	12.1	12.5	
	3	13.0	14.9	14.0	13.5	13.1	12.6	13.0	12.9	12.9	12.3	
	4	13.5	13.7	13.9	12.4	12.7	11.1	11.7	12.8	13.2	13.0	
Trial												Post-exercise
Number	5	13.2	14.3	14.0	13.5	11.9	11.4	11.3	14.0	12.2		Period
	6		13.6			12.2	11.8	12.5	11.5			
	7						13.3	11.0				
	8							11.1				
13.4*		13.3	13.6	13.8	13.1	13.0	12.0	11.8	12.7	12.5	12.6	12.3*

* These averages and all times are in hundredths of a second.

From the data in tables 3 and 4 it may be concluded that the progressive resistance exercise given did not significantly increase these subjects' muscle contraction time. It is conceivable that other individuals might react differently or that progressive resistance exercise given in a different manner or over a longer period of time might increase contraction time; but under the conditions of this study, which closely simulated clinical practice, there is no evidence that progressive resistance exercise results in increased muscle contraction time.

Summary and Conclusion

The purpose of this study was to investigate the effect of Progressive Resistance Exercise, when applied in a manner similar to that used in clinical practice, upon muscle contraction time. Two groups of subjects were used: one group served as controls and did no exercise, the other was given progressive resistance exercise.

Measurements of biceps circumference, thigh circumference and the 1 R. M. for elbow-flexion and knee-extension were taken on all subjects both before and at the end of the four months' exercise period, in order to determine whether actual changes in muscle strength and hypertrophy had been produced by the progressive resistance exercise.

Knee-extension and elbow-flexion contraction time was measured on all subjects in both the pre-exercise and the post-exercise period. At the end of their four months exercise regime there was an increase in biceps and thigh circumference and a considerable increase in knee-extension and elbow-flexion 1 R. M. Those findings indicate that progressive resistance exercise as administered had effected a change in those muscles. The results of the post-exercise contraction time tests offer no evidence that the progressive resistance exercise produced a slowing of contraction time in those subjects.

This study indicates that progressive resistance exercise given in the manner usually employed clinically does not increase muscle contraction time. Further study of more individuals, utilizing exercises over a longer period of time so that greater increases in muscle hypertrophy can be obtained, is necessary in order to verify this tentative conclusion.

PHYSICAL MEDICINE AND REHABILITATION FOR THE HANDICAPPED WORKER OVER FORTY

A Retrospect *

FRANK H. KRUSEN, M.D.

Among the problems which beset those of us who are "over forty," in addition to graying hair, lagging memories, bifocal glasses, loose dentures, and increasing waistlines, there is an unfortunate tendency to look back too much and to look forward too little. It was the great physician, Sir William Osler,[1] who said: "Many a man is handicapped in his course by a cursed combination of retro- and intro-spection, the mistakes of yesterday paralyzing the effort of today, the worries of the past hugged to his destruction, and the worm regret allowed to canker the very heart of his life. . . . Waste of energy, mental distress, nervous worries dog the steps of a man who is anxious about the future. Shut close, then, the great fore and aft bulkheads, and prepare to cultivate the habit of a life of Day-Tight Compartments." This philosophy of living chiefly in the present is a good one, not only for the handicapped workers in whom we are interested, but also for those of us who devote our attention to their care. Believing, as I do, that we should live chiefly in the present, I ask you to look back only enough to judge from the past what the future may hold, and to look forward with me only sufficiently to plan wisely, without apprehension, for the future.

While we continue to serve the handicapped by living each day to itself with no regret for, and no undue pride in, the past and with no qualms and no extravagant yearnings for the future, we can study the past objectively in the hope of making sound progress in the future.

My purpose is to look back on the history and weak beginnings of physical medicine and rehabilitation and to show that this new special field of medical endeavor offers the solution of the problems of the rehabilitation of the handicapped worker over forty and indicates that we should make every effort, in the future, to increase the number of centers devoted to this work. Past experience has taught us that in order to achieve prompt and adequate rehabilitation of the disabled person, in addition to appropriate medical and surgical care, we must provide suitable physical rehabilitation, satisfactory psychosocial adjustment, vocational advisement, and vocational placement.

Looking back on the development of physical medicine and rehabilitation, we can see that this new combined medical field offers the solution for proper rehabilitation of the older handicapped worker; therefore, all of us should strive mightily to organize centers of physical medicine and rehabilitation in various communities throughout this nation.[2]

Looking Back Briefly

The late Dr. Simon Baruch, distinguished New York physician and the father of Bernard M. Baruch, who has given so generously of his personal fortune for the advancement of our field, was perhaps the earliest pioneer in

* Read at the Conference on Rehabilitation of the Handicapped Worker Over Forty at the University of Michigan, Ann Arbor, Michigan, July 11-13, 1951.

1. Osler, William: A Way of Life. New York, Paul B. Hoeber, Inc., 1937, 41 pp.
2. Krusen, F. H.: National Program in Rehabilitation Must Be Expanded, Minnesota Med. 34: 47 (Jan.) 1951.

rehabilitation of the aged.[3] Over sixty-five years ago, long before the term "rehabilitation," as we now use it, was known, Simon Baruch, as chairman of the attending staff of the Montefiore Hospital for the Chronically Ill, wrote: "It will be a proud achievement when our records will tell that a goodly proportion of those who have entered our gates, only to die in peace, have again issued from them entirely or partially restored, and enabled again to enter upon the battle of life from which they had regarded themselves as permanently banished."[4] This is the very essence of the idea incorporated in the philosophy of the rehabilitation of the older handicapped worker and his restoration to the fullest possible physical, mental, social, vocational and economic usefulness.

It will not always be easy to determine just which handicapped workers are really "over forty," because not only will some of them hesitate to confess to their real age, but a worker who has a chronologic age of forty may have a physiologic age of fifty, a mental age of twelve, an emotional age of ten, and a moral age of four. A worker who is senescent is not necessarily senile.[5] Senescence is the inevitable physiologic process of growing older, and is not a disease in itself, whereas senility implies abnormal aging.

In following Dr. Baruch's lead toward the physical rehabilitation of older persons, physicians gained most of their experience, strangely enough, from the development of programs for rehabilitation of younger persons. It was our experience with the restoration of the casualties of war which finally led to the modern developments in physical medicine and rehabilitation. World War I gave the first impetus to the development of this specialty. World War II brought it rapidly to a point of complete recognition.[6]

The Council on Physical Medicine and Rehabilitation of the American Medical Association, the Baruch Committee on Physical Medicine and Rehabilitation, and numerous other organizations have been instrumental in bringing this field of endeavor to its present level of achievement.[7] During and since World War II, the inspiring work of Dr. Howard A. Rusk, professor of physical medicine and rehabilitation at New York University, has focused attention on the rehabilitation aspects of the field. In the meantime, sound practice, wise teaching, and meticulous research have placed our work on an ever sounder scientific basis. In 1947, an American Board of Physical Medicine and Rehabilitation was established to qualify physicians in this special field of practice; and in 1949, the American Medical Association established a regular Section on Physical Medicine and Rehabilitation.

In 1939, there were only five residencies in this special field, available at three centers. Today there are eighty residencies, available each year, at forty different centers. Before the last war, there were only a few rehabilitation centers in the entire country. Now they are springing up all over the nation. The whole program is accelerating at a rapid pace. It seems obvious that we cannot relax if we wish to keep pace with the fast-moving programs to provide adequate rehabilitation for the older handicapped worker.

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3. Krusen, F. H.: Simon Baruch — American Pioneer in Physical Medicine and Rehabilitation, Life and Health **64**:16 (June) 1949.
4. Report of the Chairman of the Staff of the Montefiore Hospital for the Chronically Ill. Simon Baruch, M.D., October 30, 1885: Quoted by Krusen, F. H.3
5. Pepper, O. H. P.: The Principles of Diagnosis and Treatment of Disease in the Elderly. Nebraska M. J. **24**:401 (Nov.) 1939.
6. Krusen, F. H.: The Future of Physical Medicine, M. Ann. District of Columbia **14**:239 (June) 1945.
7. Krusen, F. H.: The Scope and Future of Physical Medicine and Rehabilitation, J. A. M. A. **144**:727 (Oct. 28) 1950.

Nature and Magnitude of the Problem

One of the topics under discussion during this conference has to do with the nature and magnitude of the problem. To understand the nature of the problem, we should be familiar with certain definitions. *Physical medicine* may be thought of as applied biophysics. The specialist in physical medicine and rehabilitation employs various physical agents and devices, therapeutic exercises, corrective procedures, occupational therapy and physical rehabilitation in the diagnosis and treatment of diseases and injuries.

Occupational therapy may be defined as medically prescribed activity which has a therapeutic objective.

Rehabilitation may be defined as the preparation of the patient, physically, mentally, socially and vocationally for the fullest possible life compatible with his abilities and disabilities.[8] Dr. Henry H. Kessler,[9] one of the great leaders in our field, has said: "Rehabilitation has acquired new connotations growing out of civilian and military experience. It has come to be regarded as a creative process in which the remaining physical and mental capacities of the physically handicapped are utilized and developed to their highest efficiency. It is an organized and systematic method by which the physical, mental and vocational powers of the individual are improved to the point where he can compete with equal opportunity with the so-called non-handicapped." To paraphrase McKee Fisk,[10] of the Veterans Administration, the final test of rehabilitation is permanent employment at a job consistent with the ability and preparation of the worker at a wage at the going rate. Thus, the final responsibility of the rehabilitation program is to assist the disabled worker to obtain satisfactory employment, doing that for which he was trained.

To provide some idea of the magnitude of the problem, it has been estimated[2] that to staff an adequate system of rehabilitation facilities in this country, it would be necessary to recruit and train 2,500 to 3,000 medical specialists and 10,000 to 12,000 more physical therapists and occupational therapists, as well as several times 10,000 nonmedical rehabilitation personnel, such as psychologists, social service workers, and vocational rehabilitation counsellors. Furthermore, each year about 250,000 men and women are so disabled by injury or disease that they become incapable of holding a job or of enjoying a normal life. Altogether there are many millions of handicapped people in the United States today. Surveys have indicated that one and a half million of them, not including veterans disabled in service, would benefit greatly from rehabilitation services. A very high percentage of these handicapped persons is included among the workers over forty. It has been estimated, by a projection based on the latest census, that by 1980 more than 40 per cent of our entire population will be forty-five years of age or older.[11] There can be, therefore, no question about the magnitude of the problem we are discussing. The number of civilian casualties far exceeds the number of war casualties. Whereas, some 265,000 men were permanently disabled as a result of combat injuries during World War II, one and a quarter million civilians were permanently disabled, by accidents alone, in the corresponding four years.

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8. Krusen, F. H.: Physical Medicine and Rehabilitation in the United States of America With Special Reference to the Influence of the Baruch Committee on Physical Medicine and Rehabilitation in Its Development, Brit. J. Phys. Med. n. s. **13**:169 (Aug.) 1950.
9. Kessler, H. H.: Rehabilitation of the Physically Handicapped, New York, Columbia University Press, 1947, 274 pp.
10. Fisk, McKee: Medical and Vocational Rehabilitation for Veterans. In: Symposium on the Processes of Rehabilitation. National Council on Rehabilitation, New York, 1944, 32 pp.
11. Erickson, D. J., and Krusen, F. H.: Physical Therapy Comes to the Aid of the Aged, Mod. Hosp. **62**:88 (May); 88 (June) 1944.

Miss Mary Switzer,[12] director of the Office of Vocational Rehabilitation, has pointed out that we shall need two million new workers one and a half years from now. She asked, "Where are we going to find the man power to carry on?" She stressed the point that conservation of our human resources is a community responsibility and that men of education, men of medicine, men of science and men of business must combine to take their share in this conservation program. She said pertinently that people are not rehabilitated; they are only given an opportunity to rehabilitate themselves. Rehabilitation is a bridge spanning the gap between uselessness and usefulness, between hopelessness and hopefulness, between despair and happiness.

Taking one last look backward, I believe we can conclude that the patterns have been established for the rehabilitation of the older handicapped worker. Therefore, we can turn with enthusiasm to the enormous task of organization and expansion of physical medicine and rehabilitation centers throughout this land. The high motivation and keen enthusiasm of many of the older participants at this three-day conference indicate definitely that for many persons, as claimed by Walter Pitkin,[13] "Life begins at forty." Thus, when we discuss the rehabilitation of handicapped workers over forty, we are talking about a group who often have tremendous energy and who, properly guided, have much to contribute toward the welfare of our nation.

Medical Aspects

Another topic we have been discussing has to do with the medical aspects of the rehabilitation of the worker over forty. Physicians have an enormous responsibility in contributing toward this humanitarian program. Years ago, Descartes[14] wrote, "If ever the human race is raised to its highest practical level intellectually, morally and physically, the science of medicine will perform that service." It was Dr. Raymond B. Allen,[15] the famous medical educator, who said: "The medicine, science, and scholarship of tomorrow's world must forever be free to serve the peaceful needs of all mankind. . . . Medicine, with its age-old concern for the sick — the poor as well as the rich, the weak as well as the strong, has been an influence for good surpassed only by the moral precepts of religion. . . . Medicine is coming of age as a social science in the service of society. It takes a man, not a machine, to understand mankind."

The medical centers, now, must vastly increase their training programs so that an adequate supply of medical specialists in physical medicine and rehabilitation (now called physiatrists), psychiatrists specially trained in the problems of the disabled, physical therapists and occupational therapists, must be provided to staff the ever-increasing numbers of rehabilitation centers. Then only will these centers be able to rehabilitate handicapped workers.

The development of programs of rehabilitation is primarily a teaching effort. In addition to the categories previously mentioned, medical centers must train more psychologists, social workers and vocational counsellors. Furthermore, in modern rehabilitation centers, we must constantly teach our patients new skills. To do this, we must first select good students. Good students and willing workers usually will labor continuously and conscientiously and soon can be trained in the fundamentals of this new and broad approach to medical care. The late great Harvard physiologist, Walter B.

12. Switzer, Mary E.: Disability and Rehabilitation, Acuff Clin. Bull. 2:3 (Apr.) 1951.
13. Pitkin, Walter: Life Begins at Forty. New York, McGraw-Hill, 1932, 175 pp.
14. Descartes, René: Quoted by Allen, R. B.15
15. Allen, R. B.: Medical Education and the Changing Order. New York, The Commonwealth Fund, 1948, 112 pp.

Cannon[16] has said, in discussing "passing on the torch," that a few students neglect their studies until shortly before examination time and then work furiously to catch up. Cannon called such students "long distance putters" because they suggested to him the story of the complacent golfer who teed his ball, looked away to the next green and declared confidently, "That's good for one long drive and a putt." He swung his driver, tore up a stretch of sod and managed to move the ball a few feet off the tee. The caddy then stepped forward, handed him the putter and suggested, "Now for a hell of a putt!" Suffice it to say that we must find many students who are not "long distance putters." In training our patients in new skills, we must see that they start hard work at once and do not lag behind, hoping that a few months hence they will achieve complete rehabilitation by a "long distance putt."

Psychosocial Problems

Another of our topics has been that of the psychosocial problems. Certainly the key to the rehabilitation of a disabled person is the provision of proper motivation. The handicapped worker must learn, to begin with, to be like the charming young woman who, after losing both her legs, suddenly said to her physician one day, "I have just realized that instead of making the *best* of it, from now on, I'm going to try to make the *most* of it!" Even some of our keenest observers have not fully understood the implications of modern rehabilitation and then have suddenly come to the realization of how the disabled are now being trained to "make the most of it." For example, in 1948 David Hinshaw[17] wrote: "For years I had closely followed the work [of the Institute for the Crippled and Disabled in New York City] and yet I had missed the emergence through it of the miracle of the composite science of rehabilitation. Suddenly I realized that its staff was using medicine and surgery, psychology and psychiatry, therapy, patience, kindness, friendly understanding, and vocational training in their efforts to help the physically handicapped reeducate themselves to live and work and love by enlisting their minds, hearts, and bodies."

I am glad that Hinshaw mentioned the word "love," because love and romance are still highly important even to the older handicapped worker. It was the Baroness Burdett-Coutts who, at the age of ninety, was asked, "When does a woman stop hoping for romance?" She answered, "Goodness, I don't know yet!" Love and romance are among the chief sources of motivation of disabled persons. There is perhaps nothing else that will so "fire the soul." It was Jean de la Fontaine[18] who said in the seventeenth century, "Man is so made that when anything fires his soul, impossibilities vanish." Harold Russell,[19] the well known double-arm amputee, has told of the inspiration he had from learning that his fiancee still loved him. Then it was that he said, "It is not what you have lost that counts, but what you have left." So he redoubled his efforts to rehabilitate himself and soon was happily married.

That fine physician, the late Francis W. Peabody,[20] of Boston, once said: "Disease at once affects and is affected by what we call the emotional life.... The good physician knows his patients through and through, and his knowl-

16. Cannon, W. B.: The Way of an Investigator, a Scientist's Experiences in Medical Research. New York, W. W. Norton & Co., Inc., 1945, 229 pp.
17. Hinshaw, David: Take Up Thy Bed and Walk. New York, G. P. Putnam's Sons, 1948, 262 pp.
18. de la Fontaine, Jean: Quoted by O'Connor, Basil: The Glory in the Limited Life. (Privately printed.) Georgia Warm Springs Foundation, Warm Springs, Georgia, 1951, 15 pp.
19. Russell, Harold: Victory in My Hands. New York, Creative Age Press, 1949, 280 pp.
20. Peabody, F. W.: Doctor and Patient. New York, The Macmillan Co., 1939, 95 pp.

edge is bought dearly. Time, sympathy, and understanding must be lavishly dispensed . . . the secret of the care *of* the patient is in caring *for* the patient."

Economic Implications

I shall not discuss the economic implications, except to quote Bernard M. Baruch,[21] who said, "The investment in rehabilitation is an investment in the greatest and most valuable of our possessions, the conservation of human resources." Every handicapped worker who is rehabilitated and all of us who are striving to develop outstanding programs of rehabilitation owe a tremendous debt of gratitude to this great man. He has given generously of his personal fortune; he has provided unstintingly of his tremendous store of wisdom; and he has lifted us up and pushed us forward by offering liberally of his immense prestige. He has provided the means for establishing three large key centers of physical medicine and rehabilitation; he has supported programs in research and teaching in medical centers throughout the nation; he has given fellowships to over fifty young physicians; and he supported vigorously the educational efforts of his committee of scientists who worked intensively for eight years to establish physical medicine and rehabilitation on a sound basis.

The generosity of Mr. Baruch and the earnest efforts of the group of scientists who worked with him, have made the prospects for rehabilitation of the handicapped worker over forty brighter than ever before. One man, aided by one small group of educators and investigators, however, cannot hope to finish this task. As Miss Switzer has said, conservation of our human resources is a community responsibility in which all of us must participate. Each one concerned must redouble his efforts and must labor unremittingly to expand the rehabilitation programs which have been inaugurated under such auspicious circumstances.

In closing, I should like to quote the beautiful statement of John Galsworthy,[22] famed novelist. Years ago, just after World War I, Galsworthy said: "Restoration is at least as much a matter of spirit as of body, and must have as its central truth: Body and spirit are inextricably conjoined. To heal the one without the other is impossible. If a man's mind, courage and interest be enlisted in the cause of his own salvation, healing goes on apace, the sufferer is re-made; if not, no mere surgical wonders, no careful nursing, will avail to make a man of him again. Therefore, I would say: 'From the moment he enters the hospital, look after his mind and his will: give him food; nourish him in subtle ways; increase that nourishment as his strength increases. Give him interest in his future. Light a star for him to fix his eyes on, so that, when he steps out of the hospital, you shall not have to begin to train one who for months, perhaps years, has been living, mindless and will-less, the life of a half-dead creature.'

"That this is a hard task none who knows hospital life can doubt. That it needs special qualities and special effort, quite other than the average range of hospital devotion, is obvious. But it saves time in the end, and without it success is more than doubtful. The crucial period is the time spent in the hospital. Use that period to recreate not only the body, but mind and will power, and all shall come out right; neglect to use it thus and the heart of many a sufferer and of many a would-be healer will break from sheer discouragement. A niche of usefulness and self-respect exists for every

21. Baruch, B. M.: Introduction. In: Rusk, H. A., and Taylor, E. J.: New Hope for the Handicapped. New York, Harper & Bros., 1949, 231 pp.
22. Galsworthy, John: Quoted in the Report of the Baruch Committee on Physical Medicine. (Privately printed.) New York, April, 1944, 50 pp.

man however handicapped; but that niche must be found for him. To carry the process of restoration to a point short of this is to leave the cathedral without a spire. To restore him, and with him the future of our countries, that is the sacred work."

DAILY ACTIVITY TESTING IN PHYSICAL THERAPY AND REHABILITATION *

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Introduction

Daily activity measurement in physical therapy and rehabilitation is rapidly progressing from a lusty infancy toward adolescence. The comparatively recent work of Sheldon,[1-2] Deaver and Brown,[3-4-5] Bennett and Stephens,[6] Buchwald,[7] and others attest to the present activity in functional testing. However, daily activity measurement will have passed adolescence only when functional tests are properly graded, scored, validated, and normed, and their all-round practicability and utility demonstrated. This paper makes no pretense of being a complete treatment of statistical methods. *It will attempt to present a unique format for the administration of a useful daily activity test and promote the system of grading and scoring employed.* Validation and norms are still in the exploratory stage and will be reported in a future paper. In speaking of the development of suitable tests, a distinguished psychologist once stated "the tree is not too far from the apple." Thus, once the qualities to be measured have been determined, and the method for evaluating the degree to which the individual possesses these qualities has been agreed upon, validation and norms should not be too far remote.

The following discussion concerns a test generally used in the Physical Rehabilitation Section of the New York State Rehabilitation Hospital, West Haverstraw, New York, a description of its purpose, development, administration and the use of results.

The purpose of the test is to facilitate the training of patients in the es-

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1. Sheldon, Marjorie P.: Physical Achievement Record for Use with Crippled Children, Jour. Health and Physical Ed. 6:5 (May) 1935.
2. Sheldon, Marjorie P.: Testing Functional Ability in the Orthopedically Handicapped, Pub. Health Nursing (Feb.) 1945.
3. Deaver, George G., and Brown, Mary Eleanor: Physical Demands of Daily Life, Institute for Crippled and Disabled, 400 First Avenue, New York 10, New York, 1945.
4. Brown, Mary, Eleanor: Daily Activity Testing and Teaching, The Phys. Therapy Rev. 27:4 (July-August) 1947.
5. Brown, Mary Eleanor: Daily Activity Inventory and Progress Record for Those with Atypical Movement, Am. Jour. Occupational Therapy, September-October, November-December, 1950, and January-February, 1951.
6. Bennett, Robert L., and Stephens, Hazel R.: Functional Testing and Training, The Physical Therapy Review 29:3 (March) 1949.
7. Buchwald, Edith: Functional Training, Phys. Therapy Rev. 29:11 (Nov.) 1949.

sential activities of daily living by clearly indicating to the physician and therapist what the patient has accomplished to date and what remains to be achieved. This functional training* involves the reestablishment of a lost function or the establishment of substitution for a lost function by teaching patient to walk with braces and crutches, and to learn self-care by means of simplified techniques. Here are included the objectives of learning how best to handle the body in overcoming the residual effects of the disability, and the efficient use of acquired strength and learned skills in practical everyday living, with a view toward complete independence and self-sufficiency.

Shortcomings of Existing Daily Activity Tests

Williams and Brownell[8] have suggested that techniques of educational measurement are apt to reflect the concepts of the prevailing philosophy of a school program. They observe that when education is viewed as a science, precise measuring instruments are sought to evaluate the child's progress in school, and that when teaching is regarded as an art, scientific accuracy in measurement gives way to a more general evaluation of the child.

It is no less true in physical medicine than in education that we seek to evaluate the patient's improvement in the light of accepted concepts of rehabilitation. For example, if a program of physical rehabilitation is concerned with adult patients and the problem of "return to work," test items will include among other things, testing devices for "on the job" conditions and methods of evaluating patients in the physical requirements of a job. If a program is concerned with pre-school children, a test might reflect normal growth and development levels for various ages rather than activities of daily living, because of the physical immaturity of the child.

It is a useless procedure to conduct tests which contribute little or nothing toward desired objectives. Thus, in selecting tests in physical therapy and rehabilitation we must decide upon purposes and objectives and then consider what test and measurement items may best promote their achievement.

Various existing direct activity tests were used at the Rehabilitation Hospital as aids in determining the physical rehabilitation needs of the patient and in developing treatment plans to meet these needs. Each test selected and used failed to bridge the gap that existed between our aspirations for patients, as expressed in our purposes, and the actual functional accomplishments of the patient in the essential activities of daily living. This condition prevailed for several reasons. A common mistake of many daily activity or functional tests is that they undertake too much, and consequently, therapists feel that the tests are too lengthy and time consuming to administer in their present forms. Because the purposes of most of the tests used are too general, it is almost ludicrous to patient and therapist alike to evaluate performances in activities where it is self-evident that it can be accomplished. According to Ross[9] there is really only one fundamental purpose in all measurement, namely, to understand someone better. To contribute to the understanding of the individual, the test items should be appropriate for the individual and the purpose of the testing.

Present day daily activity tests fail, in most instances, to include enough endurance activities to meet the functional needs of the types of patients

* Functional training and daily activities mean simply the activities essential for daily living, which ordinarily the average citizen takes for granted, but nevertheless, are necessary in order to live a life of independence. For example, the disabled individual has to walk up and down steps, get in and out of bed, be able to get from wheelchair to an ordinary chair or from a wheelchair to an erect position, etc.

8. Williams, Jessie Feiring, and Brownell, Clifford, L.: The Administration of Health and Physical Education, W. B. Saunders Co., Philadelphia and London, 1939.

9. Ross, C. C.: Measurement in Today's Schools, Prentice-Hall, Inc., New York, 1947.

admitted at Haverstraw or their post-hospital environments. In other words, existing tests when modified for administration at this hospital, did not meet the needs of the activity "break-down" of the Physical Rehabilitation Section, nor permit maximum utilization of the section's equipment and facilities, which are designed to meet the "true-to-life" experiences of our particular types of patients.

Against some daily activity tests, it has been argued that they are difficult to grade and score. Many tests completely lack or take for granted a system of grading and scoring, so that an analysis of test results is complicated and confusing. If daily activity tests are to permit therapists to do something about the situations revealed, then a system of grading and scoring should be employed that will facilitate interpretation and utilization of the results.

From the viewpoint of administration at this hospital, a new format for testing functional activities was indicated, since the Occupational Therapy Section presently tests and teaches approximately seventeen hand activities included in the average run of daily activitity tests.

Criteria for a Satisfactory Daily Activity Test

In constructing the present daily activity test it was necessary to set forth certain criteria against which the final product could be evaluated. An ideal test would possess a number of features which group themselves under two major objectives: *first*, the test should *reveal useful information* and *second*, it should be *administratively practical*.

With regard to the first of these objectives there are five areas in which the test should contribute to evaluation of the patient. *First*, it should show his ability or lack of ability to perform a variety of activities encountered in daily living. Since all activities cannot be tested, those activities appear in the test should be as representative a sample as possible, to include the most important tasks the patient will meet, and to approximate the actual conditions under which they will be performed following discharge from the hospital. The test should give some indication of his capacity for self-sufficiency in bed, within the home, in traveling, in doing housework, attending school, or working at a job wherever appropriate. *Second*, we should expect a measure of the patients' proficiency in performing these activities in terms of the time required, the assistance needed to perform the task or to meet requirements of safety, and his endurance in carrying them out. *Third*, since we are discussing an ideal test, it would be advantageous to ascertain the reasons for his failures, such as lack of muscle power, poor balance, inadequate training, fatigability, apprehensiveness. Despite the importance of this area, it would seem beyond the scope of the present test. Until such time that these factors can be isolated and measured in the form of a "Diagnostic Test of Functional Ability," it will be necessary to rely on the subjective judgment of the doctor and therapist to avoid these failures. *Fourth*, we should expect an indication of the over-all extent of the patient's rehabilitation and the amount of future progress that may be expected. *Fifth*, we should expect some general summation of the patient's present and probable future status as a custodial, wheelchair, or ambulant individual.

The second general objective stated above tends both to complicate and to restrict proposed features of an ideal test. *First*, the test should be applicable to bed, wheelchair, and ambulant patients, with and without apparatus, and of varying degrees of motor ability. *Second*, it should allow for progressive testing of recuperating patients from bed to upright locomotion. *Third*, it should permit recording of data from retests on the same sheet so that the patient's progress will be readily apparent without referring to a multitude of forms.

Fourth, it should provide separate indices of functional independence for different classifications of patients such as bed, wheelchair, and ambulant. Furthermore these should be an additional measure which would not be misleading when comparing patients in one classification with those in other classifications, and which would give an indication of the functional ability of a patient in comparison with a physically normal adult. Stated more concretely, we need to compare the wheelchair patient, for example, with the maximally independent wheelchair patient, to the ambulant or bed patient and to a physically normal adult. *Fifth*, we would benefit from a system of scoring which takes into account not only the number of activities accomplished, but the facility with which they were performed. Without adequate recognition of the latter, a spurious comparison may be obtained between two patients who perform the same number of activities, but with widely difficult degrees of skill. Similarly, we might tend to underrate the patient who did a few things well, as compared with the patient with marginal ability on many items. *Sixth*, the test should be as concise and as brief as possible, eliminating duplication of activities and avoiding the testing of severely disabled or advanced ambulatory patients on activities inappropriate to their level of rehabilitation. *Lastly*, we would hope for the test to be as simple as possible to administer, score, and interpret.

Description and Use of the Test

The present test represents our efforts to satisfy as many of the above objectives as possible. Activities appearing in the scale were selected because they represented a variety of skills important in the rehabilitation of patients at this hospital. Whenever possible, unnecessary items which did not contribute to an over-all evaluation of the patient were eliminated. By providing separate scales on the same form for the testing of bed, wheelchair, or ambulant patients it was possible to limit inappropriate or duplicated activities and at the same time indicate to the therapist which items should or should not be tested for each type of patient. Such a format also permits successive evaluation of a patient at different stages of rehabilitation.

The test is composed of 76 activities arranged approximately in order of increasing difficulty. To the left of the description of the activity is the time limit (ST = Standard Time) allowed for performing the task. The times listed represent a crude average of the time required by patients who had achieved a maximum degree of rehabilitation to accomplish the activity under local conditions. In other hospitals it is expected that the time limits and perhaps the activities themselves will have to be modified. The right half of each test page consists of four columns labeled to indicate their use for patients described as "Bed," "Wheelchair," "Ambulant With Apparatus," and "Ambulant Without Apparatus." Within each column appears a series of four boxes opposite the description of the test activity. These boxes have been included wherever the test item is appropriate to the type of patient being examined, and a blank space indicates that the patient need not be examined on the item. Thus, there are 20 items for bed patients, 50 for wheelchair, 60 for ambulant with apparatus, and 40 for ambulant without apparatus. At the top of the column the significance of each box is indicated by the letters "PT," "P," "I," and "T," referring to "Performance Time," "Performance," "Independence," and "Time." In using the test, the patient attempts each item appropriate to his classification as *bed*, *wheelchair* or *ambulant*. The time required to perform the activity is entered in the box under the heading "PT," and his degree of success is indicated by symbols entered in each of the three boxes according to the scheme noted under "Key to Grad-

ing" in the second section of the sample test appearing at the end of this paper.

Key to Grading

In the reproduction of a sample test sheet which appears on pages 106-107 the "Keys" are listed as follows:

Unable to perform the activity.
Performs awkwardly or needs more practice.
Performs activity satisfactorily.
Unable to perform the activity without assistance.
Assistance necessary only for reasons of safety.
Performs activity independently.
Requires more than twice the allotted time.
Requires not more than twice the allotted time.
Able to do the activity within the allotted time.
Not tested.
Not applicable.
Unable to perform activity.
Performance within normal limits.

If for some reason the patient was not tested on an activity, the boxes are left blank, or if the activity was not applicable a horizontal line is drawn through the three boxes. It is suggested that the marking of the symbols for the initial testing be made in *black* and that marks for subsequent testing be made in *red*. Thus, a diagonal in red over a black zero or an X completed in red would show improvement. If desired, the right hand margin may be utilized to enter the date of accomplishment of items not successfully performed during the initial testing. In addition to permitting the recording of improvement, the breaking up of scoring into three factors with degrees of ability within each presents distinct advantages for interpretation. By various combinations of the above symbols it is possible to indicate a total of 19 degrees of proficiency, ranging from complete inability to independent performance within normal limits.

Patients may be tested as bed patients and then be given the wheelchair or ambulant scales as their progress warrants. Or a patient may be tested on two scales, such as wheelchair and ambulant with apparatus, to compare his functional ability in each. Where an activity does not require modification in applying to more than one classification, accomplishment in one column warrants credit in all columns where applicable, without retesting. For example, if a bed patient demonstrates his ability to dress and undress satisfactorily, he may be credited with this activity as a wheelchair or ambulant patient without retesting. On the other hand, the performance of certain items* varies as it applies to different classifications and must be given again when the patient progresses in his status. For example, No. 37 "To standard chair," in the case of a wheelchair patient means moving from a wheelchair to a standard chair, while in the case of an ambulant patient, it refers to his ability to seat himself from the erect position.

Summary of Test Performance

Summary Based on Complete Success or Failure. — Having administered the test to the patient and recorded his proficiency in performing the appropriate activities, a summation of his functional ability is desired. This may be done in several ways and can be as detailed as the needs of the situation demand. First, for the information of the therapist a glance at the symbols entered opposite the activities under *performance, independence* and *time* should give a qualitative indication of the patient's specific accomplishments and failures, his

* See test sheet, pp. 106-107, items 25, 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 45, 44, 45, 46 — 51, 52, 53 — 62, 63, 64 and 67.

need for assistance, and the speed with which he performed the tasks. For purposes of training the patient, this is all that is required and no further scoring needs to be done. This item by item analysis will show specifically what the patient can and cannot do, and on what activities he requires further training. This is the primary concern of the therapist.

If a summary is desired for use of the physician, preparation of reports, statistical studies, etc., provision is made at the end of the test for computing various totals and percentages. For a crude summary, count the number of items which the patient was able to perform within normal limits. Also count the number of items regarded as not applicable. The sum of these two is then entered in the appropriate space. The number of items the patient was totally unable to perform and the number of items on which he was not tested are similarly totaled and entered. The sum of these two entries will not equal the total of applicable items for his classification, since items which he accomplished marginally have not been included. The totals may easily be converted into percentages. It will be noted that the total number of items applicable to each classification has been adjusted to end in zero (i. e., is a multiple of ten) in order to facilitate division. To preserve this advantage, all "not applicable" items are included with items "performed within normal limits" in computing the percentage. Since the maximum number of "not applicable" items for each classification will be small in relation to the total, it is felt that the saving in time and ease of computation justifies the small degree of error, if any, which will result. The percentage of activities the patient was able to perform within normal limits ("per cent within normal") is thus calculated as follows: Divide the number entered opposite "Total within normal plus not applicable" by the number of items given on the sheet for that classification (Bed 20, Wheelchair 50, Ambulation With Apparatus 60, Ambulation Without Apparatus 40). Percentage of items completely failed ("per cent failed") is arrived at by the same procedure.

Summary Based on Partial Success or Failure. — Since the above totals and percentages fail to include items which were failed marginally, it is valuable to have a more accurate index of functional ability which takes into account the patient's degree of facility in performing the activities. This more accurate and detailed summation of the patient's physical accomplishments is obtained by assigning weights to the symbols so that degrees of facility can be quantified and an arithmetic total score obtained. In assigning numerical weights to the various symbols appearing in the sets of three boxes for each activity the values noted in the second section of the sample test under "Values of Symbols in Computing Weighted Scores" are used.

Using this system, the total weighted score for each column of boxes in the classification is counted and entered in the appropriate spaces opposite "Sum of weighted scores" and the three totals added together to comprise the "Total weighted scores." Computation of the percentage may be accomplished by dividing the latter total by the maximum weighted score possible as given on the test. The resulting percentage gives an index of the degree of rehabilitation the patient has achieved as a bed, wheelchair, or ambulant patient, as the case may be.

Since it is also desirable to know the patient's approximate functional capacity on the test as compared with that of a physically normal person, another percentage is required. The basing of such a percentage on a common standard permits direct comparison of bed patients with wheelchair patients, etc., and gives an over-all indication of functional capacity. No claims are

made for the accuracy of the measure about to be described, but it is felt that it provides a reasonable comparison among patients in different classifications without the necessity of excessive computation.

Stated briefly, the logic behind the method of calculation is as follows: The test itself is comprised of 76 items. However, particularly in the case of wheelchair vs. ambulant patients, the manner of accomplishing the items changes from one classification to another. For example, we ask a patient to "move 300 feet." In one case he does the task in a wheelchair, in the other case by ambulation. In effect then, this is not one, but two activities. The same principle applies to a number of the items in the scale. We selected 24 items* which most obviously were performed at two levels, choosing this number in order to raise the total activities of the test to an even 100. All of the 24 items involved ambulant vs. wheelchair functioning and were not concerned with bed activities.

Now, if we accept the fact that a physically normal adult would be capable of performing all of the 100 activities on the scale (including the 24 items at both wheelchair and ambulant levels), and test a patient on all these activities, then his over-all functional capacity would be expressed in terms of the ratio between his test performance and the maximum score attainable on the entire test. This ratio would then be converted into a percentage of all activities of the test which he was able to accomplish. This would necessitate the process of eliminating duplicated items in counting his score. Furthermore in a practical situation we would generally test the patient only on those items applicable to his classification as a bed, wheelchair, or ambulant individual. If we assume that he would be able to accomplish the tasks applicable to lower classifications, on which he was not tested, and conversely fail those in higher classifications, then we can dispense with administering the test in its entirety. This assumption becomes more tenable in the case of wheelchair patients if we consider that complete or partial failures which might occur below his classification would tend to be balanced by complete or partial success on items at higher classifications. The problem then becomes one of giving the patient credit for easier items on which he was not tested. In the case of the wheelchair patient there are 8 bed items on which he would not be tested and these should be credited. There are 40 easier items to be credited in the case of patients ambulant with apparatus, and 60 items to be credited for patients ambulant without apparatus. The latter numbers are derived simply by subtracting the number of items appearing in the classification from the total of 100 items represented on the entire test.

The foregoing description explains how the present system of scoring was derived but need not be consulted in applying it. For purposes of a quick summary of over-all functional ability it is necessary only to note the number of items on a particular scale which were performed "within normal plus not applicable," and add to this a number which compensates for easier items not tested (for Bed add 0, for Wheelchair add 8, for Ambulation With Apparatus add 40, and for Ambulation Without Apparatus add 60). Since the maximum score has been adjusted to total 100, no further arithmetic is required and the resulting number represents the percentage of activities totally accomplished by the patient in relation to those of a physically normal individual ("Per cent of normal function").

If weighted scores have been calculated in order to take into account items accomplished with partial success, then a more accurate percentage of over-all functioning ability can easily be obtained. To the "Total weighted

* As previously mentioned, an asterisk appears before these items on the test sheet (pp. 106-107).

Test Sheets.

NEW YORK STATE REHABILITATION HOSPITAL, WEST HAVERSTRAW, NEW YORK
Department of Physical Medicine - Physical Rehabilitation Section

Sec	FUNCTIONAL ACTIVITIES	BED				W/C				AMB W/A				AMB W/OA			
		PT	P	I	T	PT	P	I	T	PT	P	I	T	PT	P	I	T
15"	1 Roll From Supine To Prone																
15"	2 Roll From Prone To Supine																
10"	3 Move Toward Head Of Bed																
10"	4 Move Toward Foot Of Bed																
10"	5 Reach Night Stand, Left																
10"	6 Reach Night Stand, Right																
30"	7 On Bedpan																
30"	8 Off Bedpan																
10"	9 Cleansing after Toilet																
1'	10 Manage Clothing for Toilet																
1'	11 Readjust Clothing After Toilet																
10'	12 Give Self Bed Bath																
15"	13 Move From Supine To Sitting																
3'	14 Manipulate Corset, Sling - On																
1'	15 Manipulate Corset, Sling - Off																
15'	16 Putting On Braces																
10'	17 Taking Off Braces																
15'	18 Dress With Braces, Apparatus																
15'	19 Undress With Braces, Apparatus																
5'	20 Dress Without Braces, Apparatus																
5'	21 Undress Without Braces, Apparatus																
1'	22 Move 30 ft. (Sitting, Angeling, Etc)																
15"	23 Ascend 3 Steps W Braces, Crutches																
15"	24 Descend 3 Steps W Braces, Crutches																
30"	25 To Bed																
30"	26 From Bed																
10"	27 Lower Footrests On Wheelchair																
30"	28 Wheelchair To Standing																
30"	29 Standing To Wheelchair																
10"	30 Raising Footrests On Wheelchair																
15"	31 Going Forward 30 Feet																
15"	32 Going Backward 15 Feet																
10"	33 Complete Turn To Right																
10"	34 Complete Turn To Left																
30"	35 Pull Door Open, Go Thru & Close																
30"	36 Push Door Open, Go Thru & Close																
30"	37 To Standard Chair																
30"	38 From Standard Chair																
30"	39 On Toilet																
30"	40 Off Toilet																
30"	41 In bathtub Or Shower																
30"	42 Out Of Bathtub Or Shower																
10"	43 Over Doorsill																
10"	44 Over Carpet Or Rug																
30"	45 To Floor																
30"	46 From Floor																
1'	47 Into Automobile																
1'	48 Out Of Automobile																
2'	49 Management Of Wheelchair Into Auto																
2'	50 Management Of W/C Out Of Auto																
1'	51 Pick Up 5 Lb. Pkg-Carry 10 Feet																
15"	52 Up Ramp, 4 Feet																
12"	53 Down Ramp																
5'	54 Ascending Curb																
REMARKS:																	

NEW YORK STATE REHABILITATION HOSPITAL, WEST HAVERSTRAW, NEW YORK
Department of Physical Medicine - Physical Rehabilitation Section

ST	FUNCTIONAL ACTIVITIES (con't.)	BED PT	BED P	BED I	BED T	WC PT	WC P	WC I	WC T	AMB WA PT	AMB WA P	AMB WA I	AMB WA T	AMB WOA PT	AMB WOA P	AMB WOA I	AMB WOA T
5"	55 Descending Curb																
30"	56 Up 3 Standard Steps With Handrail																
30"	57 Down 3 Steps With Handrail																
30"	58 Up 3 Standard Steps W handrail																
30"	59 Down 3 Steps Without Handrail																
10"	60 Ascending Bus Steps																
10"	61 Descending Bus Steps																
1'	62 Move 300 Feet, Pavement																
12'	63 Move 880 Feet, Pavement																
20"	64 Move 30 Feet, Rough Terrain																
8'	65 Ambulate 440 Feet, Linoleum																
2'	66 Up and Down One Flight Of Stairs																
15'	67 In & Out, Theatre Seat (Aisle Seat)																
20"	68 In & Out, Theatre Seat (3 Seats In)																
20"	69 Crossing Street (48 Feet) On Signal																
30"	70 Ascending Train Steps																
30"	71 Descending Train Steps																
5'	72 Use Hands, Standing, Balance																
10Hr	73 Keeping Braces On For 10 Hours																
	74 Drive Car (Appropriately Equipped																
4Hr	75 Independent Of WC For One-Half Day																
8Hr	76 Independent Of WC For A Full Day																

P I I T	KEY TO GRADING
O	Unable to perform the activity
⊠	Performs awkwardly or needs more practice
⊠	Performs Activity Satisfactorily
O	Unable to perform the activity without assistance
⊠	Assistance necessary only for reasons of safety
⊠	Performs activity independently
O	Requires more than twice the allotted time
⊠	Requires not more than twice the allotted time
⊠	Able to do the activity within the allotted time
	Not tested
	Not applicable
O O O	Unable to perform activity
⊠ ⊠ ⊠	Performance within normal limits

KEY TO SYMBOLS

ST - Standard Time
PT - Performance Time
P - Performance Rating
I - Independence Rating
T - Time Rating
WC - Wheelchair
AMB WA - Ambulation With Apparatus
AMB WOA - Ambulation Without Apparatus

SUMMARY BASED ON COMPLETE SUCCESS OR FAILURE

	PT	P	I	T
1. Total within normal plus not applicable				
2. Total failed plus not tested				
3. Number of items in classification	20	50	60	40
4. Percent within normal (divide #1 by #3				
5. Percent failed (divide #2 by #3				
6. Easier items untested in classification	0	8	40	60
7. % of normal functioning (#1 plus #6)				

SUMMARY BASED ON PARTIAL SUCCESS OR FAILURE (WEIGHTED SCORES)

Value Of Symbols In Completing Weighted Scores

☐ =0 ⊟ =0 ⊠ =1 ⊠ =2 ⊟ =2

	PT	P	I	T
a. Sum of weighted scores				
b. Total weighted scores				
c. Maximum weighted scores	120	300	360	240
d. % of maximum (divide b. by c.)				
e. Value of easier items not tested	0	48	240	360
f. Sum of b. and e				
g. % of normal functioning (divide f. by 4				

NAME:

Date of Initial Test _____
Retest Date _____

scores," add a number which gives credit for the weighted value of easier items not tested (for Bed add 0, for Wheelchair add 48, for Ambulation With Apparatus add 240, for Ambulation Without Apparatus add 360). Divide the resulting sum by six, and the number obtained represents the percentage of over-all functioning as measured by the test, in comparison with that of a physically normal person, giving credit for the patient's partial successes.

Interpretation of Results

While the description of the above procedures may sound involved at first reading, it should be pointed out that several methods of evaluation have been described. For the purposes of the therapist who is interested in what the patient can or cannot do, a summation may not be necessary. By inspection of the items the therapist can determine activities accomplished or failed, follow the patient's improvement, and note the degree of assistance required and whether or not the patient is slow in accomplishing specific activities. Since the physician generally desires a more general indication of the patient's degree of rehabilitation, the percentages described above have been presented. For a simple summation, the percentages dealing only with activities performed successfully within normal limits may be employed. For a more accurate picture, percentages based upon weighted scores, which include activities incompletely accomplished, is recommended. Lastly, by reference to percentages expressing comparisons between the patient and his own classification, and those showing his relation to a physically normal person ("Per cent of normal functioning") a better perspective of functional ability is obtained. With continued use of the test, it should become apparent what range of scores should be considered critical for characterizing a patient as bed, wheelchair, or ambulant. If a patient's score is regarded as exceptionally high or low for the particular classification in which he is tested, then he should be tested on the next higher or lower classification. What comprises a relatively "high" or "low" score can best be determined by further experience with the test and the judgment of the doctor and therapist.

The authors wish to thank Doctor Austin J. Canning, Director, New York State Rehabilitation Hospital, for his helpful encouragement in the development of the test and for his insistence that we write about this test.

We are gratefully indebted to Miss Elaine Mulligan, Stenographer, Physical Rehabilitation Section, who gave willingly of her free time to typing the manuscript and rendering valuable stenographic assistance in many other ways.

ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.·. EDITORIAL .·.

AMERICAN BOARD OF PHYSICAL MEDICINE AND REHABILITATION

The next examinations for the American Board of Physical Medicine and Rehabilitation will be held in Chicago, June 8 and 9, 1952. The final date for filing applications is March 31, 1952. Applications for eligibility to the examinations should be mailed to the Secretary, Dr. Robert L. Bennett, Georgia Warm Springs Foundation, Warm Springs, Georgia.

A TRAINING PROGRAM FOR REHABILITATION

The development of the concept of rehabilitation of the physically handicapped has produced a fundamental change in the practice of Physical Medicine. The field of activity has been extended from the application of physical therapy and occupational therapy to the hospitalized or clinic patient to a program involving medically supervised activity and training to restore the patient to maximal social and vocational independence. Of necessity this broadened scope of rehabilitation will require the training of a number of types of rehabilitation workers. If rehabilitation is to be successful, these rehabilitation workers must be trained adequately to work with the physically disabled throughout the entire range of rehabilitation. In some areas of the rehabilitation program, the present training has been adequate. Other phases of the program are in the developmental stage and there have been no adequate training courses for them. The greatest deficiencies in the rehabilitation program are the gaps existing between the various therapies. As rehabilitation moves from a demonstration stage in a few large centers to general use throughout the country, it is essential that the physiatrists examine the training programs for professional workers in the field of rehabilitation to assure that adequate standards of education and adequate and efficient coverage of all phases of rehabilitation be established.

At the present time, we have physical therapists, occupational therapists, social workers, vocational counselors, and vocational teachers officially in the rehabilitation program. Where there are deficiencies in our present programs, other groups are clamoring for admission as separate specialties in rehabilitation. Of necessity, all of these groups will need medical supervision. All specialist groups need to have their training qualifications and their therapeutic contribution evaluated to assure that complete and efficient rehabilitation is provided. The basic concept of rehabilitation is the recognition of the disabled patient as an individual who has a number of potential abilities which should be developed maximally to restore him to the greatest possible physical, mental, social and vocational usefulness. In order that each of the professional groups have an understanding of this total concept of rehabilitation, it is important that rehabilitation workers in all phases of the program be trained in the basis for rehabilitation, in the potential abilities of the human body and in the basic problems to be solved by the rehabilitation process.

In this issue, Arestad's article deals with the present standards of training for occupational and physical therapists. These standards of training have been established over many years to meet the demands of hospital and clinical occupational and physical therapy. These training programs should be reviewed in the light of our present needs in rehabilitation. We face two problems in establishing standards: first, to assure that the professional personnel have an adequate education to deal with physically handicapped persons; second, to make sure that the training programs do not become so involved and long that we cannot supply an adequate number of workers to carry on rehabilitation. The solution of these two problems will require careful scrutiny of the entire curriculum required of the various rehabilitation specialists and maximal efficiency in the use of the training time. Two other articles in this issue point to the need for extension of training into the field of care of the geriatric patient and in the development of the necessary daily activities by the physically handicapped.

Since this is a total medical program, it is essential that all professional persons in rehabilitation have a basic training in medical sciences in order to understand the potentialities of the disabled patients. This should include adequate training in human anatomy, with emphasis on the neuromuscular system and kinesiology. The physiological responses of the nervous and muscular systems should be taught, together with their application in the development of control, coordination, power, endurance, and speed. Since there is no general agreement on the best physiological mechanism for developing muscle coordination through therapeutic exercise, it is essential that workers in this field have an adequate background in physiology so that they can understand the various concepts of therapeutic activity proposed for clinical use. All workers in the field of rehabilitation need a basic understanding of the various disease processes which cause physical disability. This includes the pathology and the clinical pathology in the fields of internal medicine, neurology, surgery, orthopedics, and pediatrics as they apply to the physically disabled. These courses should be made a common requirement for all rehabilitation workers. It has been proposed that a basic science examination covering these basic medical concepts be given to all rehabilitation workers in addition to the examination on the particular specialty. This would insure that all workers in rehabilitation would have a fundamental understanding of the subject.

The other fundamental problem to be solved in our training program for rehabilitation is to assure that the specialties in rehabilitation be broad enough so that there are no gaps in the training program. A very practical consideration in planning for rehabilitation on a community basis throughout the country is the recognition that in smaller centers only a limited number of persons can be employed. Therefore, these workers must have adequate training so that they can supervise a relatively broad area of rehabilitation. It is only in the extremely large centers that it will be possible to have specialists concentrating on narrow areas of the field. The apparent lack of an adequately broad training program in rehabilitation has led to the development of new groups who wish to become recognized therapeutic specialists in this field. Corrective therapy was developed in the army to emphasize therapeutic exercise at the heavy resistance, high endurance, group activity level. The essential qualifications for corrective therapists and physical therapists are the same and in small rehabilitation programs it is uneconomic to duplicate personnel with an arbitrary division of activity. The reasonable answer would appear to be the extension of the training of the

corrective therapists to include the other techniques of physical therapy and the extension of the courses in therapeutic exercise for the physical therapists to cover the endurance and group activities which are necessary in a complete rehabilitation program. Likewise, recreation workers, manual arts therapists, drama therapists, music therapists, and art therapists all have attempted to establish themselves as specialists in the general field of occupational therapy. While it may be possible to hire these specialists in very large institutions, in the smaller rehabilitation centers it will be necessary to have versatile therapists who can supervise a broader area of activity. This means that the occupational therapist, as the basic professional person working in this area of rehabilitation, must have adequate training to be able to supervise all of these activities. A large gap which at present does not appear to be filled is the prevocational training which must develop as an extension of the activities of occupational therapy designed to provide the patient with the necessary skills to prepare him for vocational education. Development of this program requires considerable thought and effort. Finally, in the area of vocational counseling, the training program must be enlarged to make sure that counselors have a concept of the potentialities of the physically disabled and the problems involved in adjusting the physically disabled person to industry. There is a great difference between the counseling and testing of the physically normal individual for vocational placement and the counseling and testing of the physically handicapped individual for vocational placement. Vocational counselors must have a thorough understanding of these problems and potentialities if placement is going to be satisfactory.

The goal of such a training program is the development of teams of professional workers who have a similar background of understanding of the potentialities, the possibilities and problems of the physically handicapped individual. These teams of workers must be able to carry on rehabilitation in all of its phases, from the acute hospital stage until the patient is placed on the job. Such a team forms the basic unit for the establishment of a rehabilitation center and must be able to handle all phases of rehabilitation that the situation demands. Obviously, the team may be expanded and specialists included if the rehabilitation center is large. However, for complete rehabilitation, each center must have this basic team. Recognizing the fact that the entire team is essential in the rehabilitation program and that many centers will be relatively small, we must have a team of not more than four specialties in addition to the physician if small units are to be practical. It is necessary, therefore, that we plan the training programs so that existing specialties are broadened to cover the entire field of rehabilitation. This must be done without increasing the time for training, which is not a simple task. However, with planning it can be done. The general establishment of rehabilitation programs will not be possible until such a unified training program is available.

MEDICAL NEWS

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least three weeks before the date of meeting.

Inexpensive Accommodations for 1952 International Congress

Dr. A. C. Boyle, Hon. Secretary of the International Congress of Physical Medicine has informed The American Congress of Physical Medicine of special hostel arrangements for members of the Congress who wish to attend the meeting in London, July 14-15, 1952. Dr. Boyle writes:

The fee for one room, either single or double, is five guiness per head per week which includes dinner, bed and breakfast, with lunch on Saturday and Sunday. Applications for less than one week cannot be accepted, and for additional days the charge is 17/6 per day and 21/— per day at the week-end with breakfast and lunch as well as dinner. Members who wish to apply for this accommodation should send a reservation fee of 1¼ guineas with their application.

I would be most grateful if notice of these facilities could be made known to the members of your Society, so that they may apply to me as soon as possible. Bookings may be quite heavy and, as you will appreciate, we must know some time in advance how many delegates require this accommodation in order to make a firm contract with the Hostel.

Reservations may be made by addressing Dr. Boyle at 45 Lincoln Fields, London, W. C. 2. As of Jan. 12, 1952, the rate of exchange on the British pound is 2.79.

Society of Physical Medicine (Toronto)

A Society of Physical Medicine has been formed in Toronto, Ontario. The present membership comprises fifteen physicians who are practicing Physical Medicine in the Toronto area and who, variously, are associated with The Workmen's Compensation Board, Department of Veterans' Affairs, General Hospitals and an Institution for the treatment of paraplegics.

At the inaugural meeting on October 24th, 1951, under the Chairmanship of Dr. A. Zinovieff, a program of activities for session 1951-1952 was arranged. Dr. J. Berkeley was appointed Secretary.

The Society has already met at Sunnybrook Hospital on November 21st, 1951, for a symposium discussion on lesions of the intervertebral disc. Dr. R. Lawson was Chairman and the main speakers were Dr. Ian McNab and Dr. H. Cranfield. On January 16th, 1952, a meeting was held at St. Michael's Hospital in Toronto, under the Chairmanship of Dr. Macrae and on March 19th, 1952, at The Workmen's Compensation Board, Convalescent Center, Malton, a meeting will be held under the Chairmanship of Dr. B. H. Young.

At the present time, efforts are being made to contact physicians throughout Canada who are practicing physical medicine, with a view to the formation of a Canadian Association of Physical Medicine. It is planned to maintain liaison with such physicians by forwarding them copies of the proceedings of the meetings held by the Toronto Society. Interested physicians or organizations in Canada who have not yet been contacted are invited to get in touch with Dr. Joseph Berkeley, Secretary, Society of Physical Medicine (Toronto), % The Workmen's Compensation Board, Convalescent Center, Malton, Ontario.

Films on Rehab and OT Media

From the Office of Vocational Rehabilitation, Federal Security Agency, Washington 25, D. C., comes a new 16mm color, sound film entitled, "An Investment in Human Welfare" presenting a dramatic picture of how the physically handicapped are successfully employed and how well they have met their job demands . . . Also new is a 16mm color, sound film, "Functional Anatomy of the Hand," prepared by the National Foundation for Infantile Paralysis in cooperation with the Department of Anatomy, Duke University, School of Medicine, showing normal function of hand and forearm. For further information write to Medical Department, Division of Professional Education at the National Foundation headquarters located at 120 Broadway, NYC 5.

Kessler Institute for Rehabilitation to Hold Sixth Annual Amputee Conference

The Sixth Annual Amputee Conference will be held at the Kessler Institute for Rehabilitation, Pleasant Valley Way, West Orange, New Jersey, on May 1, 2, 3, 1952. Included in the conference will be a clinic for congenital amputee children scheduled for Saturday, May 3.

The conference will feature lectures by staff members of the Kessler Institute and visiting lecturers, in addition to instructional films and demonstrations by patients of amputee training techniques.

The conference will discuss the problems of up-

per and lower extremity amputees. The subjects will include psychological preparation of the patient, surgery for upper and lower extremity amputations, aftercare of the stump and general conditioning, prostheses, and training of the amputee.

Registration is open to physicians, therapists, nurses and counselors in the rehabilitation professions. Persons desiring to register should communicate with the Kessler Institute, Pleasant Valley Way, West Orange, New Jersey. For the first time, the Kessler Institute will issue certificates to all registrants who attend the full three-day conference.

Further details of the program will be made known as plans are completed.

Pennsylvania Academy Meeting

At the January meeting of the Pennsylvania Academy of Physical Medicine and Rehabilitation, Dr. George M. Piersol conducted the scientific program. The following papers were presented: "Physiological Phenomena of Interest in Physical Medicine," by Dr. Herbert Shapiro; "Principals Involved in a Comparative Evaluation of Various Forms of Diathermy," by Drs. H. P. Schwan and E. L. Carstensen.

Grant Awarded for Research on Multiple Sclerosis

The sum of $39,744 has been awarded to the Harvard Medical School and Massachusetts General Hospital, Boston, Mass., by the National Multiple Sclerosis Society. A research clinic will be established at the hospital for diagnosis, treatment and study of patients with multiple sclerosis.

Scientific Exhibit, A. M. A. Chicago Session

Mr. Howard A. Carter will be in charge of an exhibit symposium on noise and health.

The Section on Physical Medicine and Rehabilitation, cooperating with the American National Red Cross, the Council on Physical Medicine and Rehabilitation and various other agencies, will present an exhibit on the essential features of artificial respiration.

New York Society of Physical Medicine Meets

At the February 6, 1952, meeting of the New York Society of Physical Medicine, the following topics were presented: "The Body Image and Its Role in Rehabilitation," by Earl C. Chesher, M.D., and "Restitution of Function Following Cerebral Lesions," by Hans Lukas Teuber, Ph.D.

Illinois Chapter to Aid Indigent Arthritic Patients

The Illinois Chapter of the Arthritis and Rheumatism Foundation recently announced that a portion of the funds raised in Chicago will be used for giving medical and financial aid to indigent victims of arthritis and rheumatism in Chicago. The chapter has established 11 clinics in the city and each applicant will be placed under the care of a team consisting of a physician, therapist, rheumatologist, orthopedist, medical social worker and nurse.

Personals

Dr. **Gerald Hirschberg** addressed the New Jersey Society of Physical Medicine at its January meeting. His topic was "Diagnostic Electromyography."

At the 12th Annual Congress on Industrial Health, held at the Hotel William Penn, Pittsburgh, January 18 and 19, 1952, the following topics were presented: "Industrial Health Is Industrial Strength," by **Howard A. Rusk,** M.D., and "The Orthopedically Disabled Person," by **Edith L. Kristeller,** M.D.

Dr. **Y. T. Oester,** Chicago, is a member of the Organizing Committee of the Chicago chapter of the Walter Reed Society. The organization is composed of persons who have voluntarily served as test subjects or "guinea pigs" in research projects directed by qualified scientists.

Dr. **H. Worley Kendell** has been appointed a member of the National Advisory Neurological Diseases and Blindness Council, Public Health Service. There are twelve members on the council whose function is to advise the Surgeon General on Public Health Service activities which fall within its area of interest, keeping him informed of research activities and health problems of the Nation.

Dr. **Louis N. Rudin,** Fort Howard, Maryland, has been appointed Editor for Physical Medicine of the Current Medical Digest, published by The Williams & Wilkins Co.

William E. Mendenhall

It is with regret that we announce the death of Dr. William E. Mendenhall of Indianapolis, Indiana. Dr. Mendenhall was a Congress member of long standing.

Franz M. Groedel

It is with regret that we announce the death of Dr. Franz M. Groedel of New York City. Dr. Groedel has been a member of the Congress for many years.

Joshua M. Lee

It is with regret that we announce the death on November 30, 1951, of Dr. Joshua M. Lee of Denver, Colorado. Dr. Lee died of coronary thrombosis. He was a Congress member for many years.

BOOK REVIEWS

PIONEER DOCTOR. By *Lewis J. Moorman*, M.D. Cloth. Price, $3.75. Pp. 252. University of Oklahoma Press, Norman, Okla.

This pleasantly readable book will probably have more appeal to those associated with the medical profession but will tell an interesting story to the lay reader as well. The vast changes which have occurred in medicine during the past fifty years are here recounted by an individual who lived through them as they came about and adjusted to them accordingly — from the days of the doctors who attended patients for all their sundry ailments to the present day of specialization. Possibly the next fifty years may result in similar giant strides but here for your pleasure is an account of fifty years ago to the present told in an entertaining, smooth-moving way with amusing and pathetic anecdotes.

THE DISPENSATORY OF THE UNITED STATES OF AMERICA: 1950 EDITION. By *Arthur Osol*, Ph.G., M.S., Ph.D., Professor of Chemistry and Director of Department of Chemistry, Philadelphia College of Pharmacy and Science, Philadelphia; *George E. Farrar, Jr.*, M.D., F.A.C.P., Associate Professor of Medicine, School of Medicine, Temple University, Philadelphia, and others. Advisory Editor: *Horatio C. Wood, Jr.*, M.D., Ph.M., Professor of Pharmacology, Philadelphia College of Pharmacy and Science, Philadelphia. Volume I, Parts 1-5: Based on thirteenth revision of United States Pharmacopoeia, National Formulary, eighth edition, and British Pharmacopoeia, 1932, and its addenda. Twenty-fourth edition, 1947. Volume 2, Parts 6-7: Being commentary on new drugs introduced in fourteenth revision of United States Pharmacopoeia, National Formulary, ninth edition, British Pharmacopoeia, 1948, as well as new drugs not officially recognized. 1950 edition. (In one volume.) Cloth. Price, $25.00. Pp. 2057. J. B. Lippincott Company, 227-231 S. 6th St., Philadelphia 5; Aldine House, 10-13 Bedford St., London, W.C.2; 2083 Guy St., Montreal, 1947; 1950.

The present volume is a commentary on the new drugs introduced in the fourteenth revision of The United States Pharmacopoeia, the ninth edition of The National Formulary, and the 1948 edition of The British Pharmacopoeia, as well as other new drugs not officially recognized. Aside from its obvious practical usefulness to the physician, it makes interesting reading because every page affords a new insight into the apparently inexhaustible resources of modern chemistry. There are descriptions of eighteen new antihistaminic drugs, new hormones like cortisone, new antibiotics, and oddities like tetraethylpyrophosphate, which is at once a miotic and a pesticide and lies in the twilight zone between organic and inorganic chemistry. For each drug the authors give all the information that might be needed by the prescriber, including actions, side-effects to be watched for, dosages, vehicles, incompatibilities, and other warnings. A few familiar items, such as boric acid ointment and ammoniated mercury ointment, appear because of the recent substitution of liquid petrolatum and white ointment for the wool fat formerly used. The book can be recommended without reservation as being at once instructive and useful.

DIABETES CONTROL. By *Edward L. Bortz*, M.D., Chief of Medical Service B, The Lankenau Hospital; Associate Professor of Medicine, Graduate School of Medicine, University of Pennsylvania, Philadelphia, Former President of the American Medical Association. Cloth. Price, $3.50. Pp. 264 with illustrations. Lea & Febiger, Washington Square, Philadelphia 6, 1951.

This textbook entitled "Diabetes Control" by Dr. Edward L. Bortz has been prepared especially as a guide for diabetic patients. The text is well planned, easily understandable and should prove of particular value to any interested diabetic. The present concepts of the disease are discussed including detection, control, diagnosis and treatment of diabetes. Individual chapters cover adequately the subjects of pregnancy and diabetes, surgery and diabetes, meal planning and diabetic coma. Particularly notable and surely of interest to patients is the chapter on Answers and Questions regarding diabetes. The author discusses all forms of insulin now in use, including NPH insulin. The text is adequately illustrated and is recommended for use by diabetic patients.

DISEASES OF THE TROPICS. By *George Cheever Shattuck*, M.D., Professor of Tropical Medicine, Harvard Medical School and Harvard School of Public Health, Emeritus; Consultant for Tropical Diseases, Boston City Hospital and Massachusetts General Hospital. Cloth. Price, $10.00. Pp. 803 with illustrations. Appleton-Century-Crofts, Inc., 35 West 32nd Street, New York 1, 1951.

This textbook of Diseases of the Tropics is particularly well suited for use by the general practitioners, specialists and students. This is especially true at this time when the prevalence of tropical diseases is not confined solely to the tropics but is seen not infrequently in the returning veteran. In this regard both malaria and amebiasis are especially notable. The text is divided

into twelve parts and covers the field of tropical diseases in a very well arranged and easily readable manner. The discussion of the more important diseases such as malaria, amebiasis, the typhus fevers, leishmaniasis and others is adequate. In like manner diseases of lesser importance have been treated accordingly in more brief expositions. The public health aspects of each disease are covered and include epidemiology, prevention and control. Diagnostic measures as well as more recent treatment methods are included. The text is adequately illustrated and both the chapter references and the general index are particularly notable. The publishing is good and the book can be recommended to all physicians.

VITAMIN METHODS: Vol. II. Edited by *Paul Gyorgy*, School of Medicine, University of Pennsylvania, Academic Press, Inc., 125 East 23rd Street, New York 10, New York. XI, 740 pp. 16.3, 23.5 cm. Price, $14.50.

This volume covers the field of laboratory techniques with small animals in a systematic and detailed manner and is a valuable adjunct to Volume I which covers the physical, chemical and microbiological methods of vitamin assay. It does in fact, contain a three chapter supplement to Volume I in which are compiled many of the more recent developments in vitamin work in these fields.

The five chapters which make up Volume II treat the several aspects of vitamin research as follows: Chapter I "General Aspects of Small Animal Experimentation" by N. B. Guerrant, gives specific details on care of and experimentation with laboratory animals and is especially useful to people who have had no experience with animal work. "The Animal Vitamin Assays" is Chapter II and is written by C. I. Bliss and Paul Gyorgy. Chapter III by James Hazlitt Jones. It describes "Laboratary Diagnosis of Human Vitamin Deficiencies." Chemical signs of malnutrition are outlined and described in Chapter IV by Norman Jolliffe and as Editor Gyorgy points out in the preface this chapter should be especially valuable to physicians. Chapter V, "Statistical Methods in Vitamin Research" by C. I. Bliss gives a comprehensive and understandable discussion of statistical methods which is applicable to fields other than vitamin research.

Each chapter is preceded by a detailed table of contents and followed by a complete list of references, which greatly facilitates the use of the book as a reference. The generous use of pictures, tables and diagrams accentuates the well organized presentation of the information contained therein.

PHYSIKALISCH - DIÄTETISCHE THERAPIE. NACH KLINISCHEN GESICHTSPUNKTEN. (Physical-Dietetic Therapy. From a Clinical Point of View.) By *Dr. Hans-Georg Scholtz*, Berlin. Georg Thieme, Leipzig, 1950, $18.50.

Physical-dietetic treatment measures have had their ups and downs in the history of medicine, but the author believes that physical-dietetic therapy has found a definite place in modern medicine. He states that many physiological effects of physical-dietetic treatments have been very satisfactory, although at present they cannot be explained on the basis of our knowledge in physiology. Possibly the vegetative nervous system plays an important role in producing these effects. There exists for example an important relationship between the function of organs and the entire psychic reaction on the one hand and the changes in functions of the skin on the other. It is probable that proper use of such relationships may increase the beneficial effects of therapeutic agents.

For these reasons the author feels that the material presented in his book must emanate from the clinic and not from the laboratory. He suggests discussion of the physiological effects of physical-dietetic measures only to the extent that they are necessary to understand the clinical aspect. The correct prescription for these measures depends to a large extent upon the experience of the attending physician and to a smaller degree upon the functional diagnosis and also upon the type of constitution of the patient. In physical-dietetic therapy the best results are obtained with properly prescribed measures, careful technical procedure and proper diet.

The book is divided into two main parts: a section on methods and uses of physical therapy measures and their physiological effects, and a clinical section. The first section describes hydrotherapy, balneotherapy, light therapy, electrotherapy, high frequency therapy, ultrasound therapy, massage and exercise and climatic therapy. This first section is followed by a twenty-page chapter on the basis of the diets for patients. The second (clinical) division describes measures to be taken for various diseases such as infections, circulatory disturbances, diseases of the respiratory system, stomach and intestines, liver, gall bladder, kidney, nerves, et cetera. All measures described combine routine physical treatment, techniques—therapeutic combined with proper dietetic procedures. The book is well written and illustrated.

PHYSICAL MEDICINE ABSTRACTS

Heavy-Resistance Exercises: The "Oxford Technique." A. N. Zinovieff.

Brit. J. Phys. Med. 14:129 (June) 1951.

DeLorme described a system of "heavy resistance-low repetition exercises" to build up power and volume in various muscles, but with particular reference to the quadriceps, as opposed to "low resistance-high repetition exercises" to develop endurance. DeLorme's method was given a trial at the Department of Rehabilitation and Physiotherapy, United Oxford Hospital, but consistent difficulties were encountered. At each session of exercise, while building up to the 10 R. M., the quadriceps became so fatigued that the last quarter of the session became very exhausting to the patient. In addition, the quality of performance fell off to such an extent that full active extension of the knee was by then rarely possible, thus detracting from the value of the session and preventing the performance of the exact technique.

The principle of "heavy resistance-low repetition" seemed to have so much to recommend it that it was considered that it should be retained. However, after some consideration, it was decided to reverse the procedure, in order to make it a more physiological method of exercise and yet retain this principle. In other words, after a brief period of warming up the muscle by quadriceps drill and anti-gravity contractions, the exercise period was begun with the 10 R. M., and then the weight was reduced at the end of each group of 10 lifts, 100 lifts constituting a session. In this way it was believed that the fall in resistance could be made to approximate to the fatigue in the muscle, and yet, in each group of 10 lifts, the muscle would be exercised to its maximum of capacity. Obviously, there are many practical difficulties in estimating the rate of fatigue in different individuals, and thus assessing the amount of weight that should, theoretically, be discarded after each group of lifts. It was found after trial, however, that for the quadriceps a reduction of one pound after each group of lifts was a satisfactory average, and this was adopted. In order to maintain rapid progression, the patient attempted to increase his 10 R. M. by one pound each day, and if he was successful the new 10 R. M. was used as the starting point for the next day's exercise session. If not, no further increase was attempted on successive days until this figure had been achieved. When the 10 R. M. was less than 10 pounds, a proportion of 20 repetitions was included, so as to maintain the lowest weight used as that of the limb plus the weight-holder (4 pounds). In 55 consecutive out-patient cases with wasted and weak quadriceps muscles, careful records were kept to observe the efficacy of this technique in developing power and volume. Particular attention was paid to complaints of pain on doing these exercises and to the state of effusion, if any. These patients had no other physical therapy than the once-daily session of heavy-resistance exercises 5 days a week. They represented a cross-section of the average type of cases that are treated by the accident service of a big general hospital. Included were cases of traumatic synovitis and rotation strain of the knee, ligaments and cartilage tears of the knee, post-meniscectomies, fractured femora, fractured tibiae, and so forth. The series was not considered to be large enough for detailed case analysis. Exercises, carried out in the fashion described, resulted in an average volume increase of ¾ inch every two and one-half weeks. The 10 R. M. increased at just over one pound a day (7 pounds in 5 days), and the absolute power (measured by a single spring lift) increased by 10 pounds a week. An average of just over 2 weeks' treatment was required before discharge with normal or nearly normal power (within 10 pounds S. S. L. of normal quadriceps). The Oxford Technique, while retaining the principle of heavy resistance-low repetition, yet allows a longer period of daily exercise, with less strain on the patient or on the patients' knee. For out-patients who are working, it provides a method of developing volume and power in wasted and weak muscles, which takes only about half an hour 5 days a week. If the criteria for selection of cases are strictly adhered to, neither difficulties nor complications are experienced. It is important to note, however, that attention to detail in performing the exercise is very important in obtaining the best results, and that the daily session must be supervised by a physical therapist or remedial gymnast. As with DeLorme's technique, it has been successfully adopted for use in muscles other than the quadriceps.

Surgical Aspects of Anklyosing Spondylitis. W. Alexander Law.

Brit. J. Phys. Med 14:171 (Aug.) 1951.

Treatment falls under two headings: conservative and operative, though in actual practice they are very closely related, and the team of physician, orthopedic surgeon and physical therapist should always be at hand. The objects of conservative treatment are (1)alleviation of pain; (2) prevention and correction of deformity; and (3) maintenance and restoration of muscle tone and power, with resulting improvement in function. Pain is best controlled by the old surgical principle of rest. Immobilization of the affected joints and correction of deformity must be combined

with, and followed by, an active exercise program for the various muscle groups in order to maintain their power, tone and elasticity. In this respect respiratory exercises are very important, both for the purpose of maintaining some intercostal movement, and helping in expanding the chest and thereby counteracting the spinal deformity. Progress can be checked by recording the chest expansion at regular intervals. All forms of physical therapy are useful in these cases: Massage and heat, either superficial or deep, to soothe the muscles and encourage the blood flow through them; faradism to maintain tone and power; pool therapy for joint movement and muscle coordination. This more active phase of conservative treatment should be instituted as soon as possible, but is useless in the presence of pain with its accompanying muscle spasm, or a rising blood sedimentation rate indicating an active disease process.

A Positive Approach to Management of Cerebro-Vascular Accident. Louis Feldman.

Geriatrics **6**:214 (July-Aug.) 1951.

Apoplexy from cerebral hemorrhage is nearly always caused by hypertension, and usually occurs in people past 45 with associated arterial degeneration. Thrombosis nearly always develops in older persons with generalized arteriosclerosis. Cerebral embolism may occur at any age, and usually is secondary to valvular endocarditis, abscess of the lung, or incidental to the course of auricular fibrillation and cardiac failure. The treatment must take into consideration not only the anatomical and functional lesions but also the personality of the patient. For the sake of clarity the treatment may be divided into that of the acute or emergency stage and that of the rehabilitation or convalescent period. In the case of a cerebral vascular accident, the internist, neurosurgeon and physiatrist are called in and plans are laid for the immediate and long-term care of the patient. The fields of treatment of the three tend not to overlap or contrast and may complement each other to the patient's benefit. In planning physical therapy and rehabilitation measures, the patient's general condition and cardiovascular tolerance must always be kept in mind. Blood-pressure and pulse readings should be taken on all patients before and after physical therapy measures have been carried out. As soon as possible a skeletomuscular functional evaluation test should be made, including a careful psychological and psychiatric check-up. These tests are repeated at intervals during the course of treatment and accurate records kept. A patient who has severe brain damage so that he does not understand orders given him, or who has a defective memory or is unable to concentrate, is a poor subject for rehabilitation. It also has been observed that the lower extremity recovers sooner than the upper one. It has been suggested that only those cases be selected for rehabilitation which are considered susceptible to improvement. Patients suffering from malignant hypertension, encephalomalacia or advanced senility should certainly not be included in such programs, since the results always will be disappointing. A trial period of supervised activity must precede any rehabilitative measures in hypertension. Where hemorrhage was the underlying factor, much caution is required. Exercises must be carried out in bed only, after the first two or three weeks; then gradually the patient may be taught to sit up in bed and start other procedures.

Certain contractile currents, notably the slow sinusoidal current with 20 to 40 contractions per minute, have proven valuable in the early stages of rehabilitation to stimulate contraction of flaccid muscles and keep up muscle tone and trophism of joints and surrounding tissues. These treatments, given for almost 15 minutes daily with a strong enough contraction to produce tension on the involved muscles, are continued until voluntary active motion returns. In many cases it has helped the reeducation of muscle function and has retarded muscular atrophy.

The patient's limbs should be put through relaxed or passive movements by a trained individual several times a day to the limit of muscular strength and joint range. Later active assistive and resistive exercises are added. Suspension-pulley therapy, which may be instituted while the patient is still in bed, will encourage movement of the arm or leg on the affected side and will assist in the reeducation of reciprocal motion fundamental to walking. Deltoid muscle setting, together with the pulley exercises, helps prevent so-called "frozen shoulder." As the arm becomes more freely movable, pain decreases. This procedure should be carried out for at least 15 minutes three times daily. Also indicated is a short period of bed strengthening-exercises, such as sitting on the edge of the bed and later standing beside it. Ambulation may be started by having the patient stand between two sturdy chairs placed back to back beside the bed. He is told to grasp the back of one chair with the good hand and the other one with the affected hand. It may be necessary to begin with to tie the affected hand to the chair with a bandage or to make use of a canvas mitt with straps that can be fastened to the apparatus. To reestablish reciprocal motion, the right foot is advanced as the patient pushes the left chair forward, and as the left foot is advanced the right chair is pushed forward. At the same time he is given arm-swinging exercises. As he progresses, walkers or parallel bars are used to retrain him further in standing and walking. Modified Frankel exercises have proved valuable for coordination. All efforts are directed toward inducing self-sufficiency and independence. If at the end of 9 to 12 months of intensive treatment, certain groups of muscles have shown no return in function, or if certain contractures persist, corrective surgical procedures should be tried. An attempt is made to rehabilitate the patient so that he may resume his original occupation or be

taught a new one, or at least make himself independent in his daily personal activities.

Thrombophlebitis. Jack T. Rush, and James H. Forsee.

U. S. Armed Forces M. J. **2**:1169 (Aug.) 1951.

Ninety-nine patients with acute thrombophlebitis occurring in 42,939 admissions were treated with anticoagulants between January 1, 1947, and December 31, 1949. The results were satisfactory in 97 patients; 2 required inferior vena cava or right common iliac vein ligation to prevent further pulmonary emboli. One 74-year-old patient died of pulmonary emboli, suddenly and without having received antocoagulant therapy following appendectomy. Penicillin is used in the presence of cellulitis. Lumbar sympathetic nerve block has been especially beneficial in relieving arteriospasm. Short wave diathermy is of value in treating the postphlebitis fibrositis. The occurrence of pulmonary emboli can be minimized by meticulous pre- and postoperative care. Patients with pulmonary emboli require immediate therapy. Postphlebitic venostasis has been treated with good symptomatic results by superficial femoral vein ligation, combined when indicated with lumbar sympathectomy.

Teamwork in the Rheumatic Diseases. A. G. Timbrell Fisher.

Brit. J. Phys. Med. **14**:169 (Aug.) 1951.

The need for the closest cooperation between the physician, whether consultant or general practitioner in charge of the rheumatic patient, and other members of the team such as the orthopedic specialist, the physical therapist, the biochemist, bacteriologist, psychologist and others too numerous to mention, is, as most people are now aware, of vital importance. The physical therapist is one of the most important members of the team, and this fact is now almost universally admitted. The closest cooperation between the physician or orthopedic specialist who prescribes physical treatment and those who administer it is extremely important. In orthopedic cases Fisher has found that it greatly increases keenness and efficiency if the physical therapist is present at any orthopedic operation upon a patient who has previously been under her care and if the principles of any after-treatment are explained. This particularly applies to manipulative operations. In those hospitals where there is a practitioner of physical medicine, similar full and frank discussion is desirable. Physical treatment is not only of immense value, either before or after orthopedic operations, but invaluable as a concomitant to "medical" treatment. Wasting and deformity are not so dramatic in the chronic ambulatory patient as in the acute patient, but they undoubtedly occur, often very insidiously, and with very few exceptions the help of the department of physical therapy always should be sought. There are very few cases where such treatment is not of definite value, enhancing the results of purely medical treatment. It is necessary to emphasize these points strongly because one not infrequently sees patients who have been treated for long periods by purely "medical" treatments—drugs, vaccines, and so forth—and whose condition could have been greatly bettered if physical therapy had been given simultaneously.

Hypoventilation Syndrome in Bulbar Poliomyelitis. Stanley J. Sarnoff; James L. Whittenberger, and John E. Affeldt.

J. A. M. A. **147**:30 (Sept.) 1951.

Because of the complex nature of respiratory inadequacy due to bulbar poliomyelitis and the severity of associated disturbances in acutely ill patients with this disease, there is little precise knowledge of the disturbed respiratory mechanism itself. In a patient whose muscles of respiration do not coordinate and whose respiratory air flow pattern is grossly irregular, it is sometimes difficult to tell whether the irregularity is caused by involvement of the respiratory center or by the airway difficulties engendered by cranial nerve involvement. It is suggested that this results from an altered sensitivity of the respiratory center to carbon dioxide consequent to medullary involvement in this disease. Verbal artificial respiration can be effectively administered under these circumstances if the patient is responsive and is observed continuously by competent personnel, and if it is not required for too prolonged a period. This type of respiratory defect may occur more frequently than supposed, but may be masked by the more obvious abnormalities of breathing in bulbar poliomyelitis. The possible hazards of oxygen administration under these conditions have been mentioned. These potential hazards would, however, be readily overcome if any significant diminution of spontaneous ventilation is reversed by some means of artificial respiration. Electrophrenic respiration may be of help under circumstances where spontaneous respiration is inadequate or becomes so following the administration of oxygen. It is obvious that at least one phrenic nerve must be uninvolved by the disease if electrophrenic respiration is to be used.

Chronic Arthritis of Senescence. Russell L. Cecil.

Geriatrics **6**:179 (May-June) 1951.

Senescence inevitably brings with it various ailments and disabilities, one of the commonest of which is some form of arthritis or rheumatism. These forms are discussed as to their effect on the aging patient. Physical therapy is recommended as an adjunct in the treatment of these conditions.

19TH ANNUAL EASTER SEAL CAMPAIGN
March 13-April 13, 1952

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CHICAGO SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

The regular March, 1952, monthly meeting of the Chicago Society of Physical Medicine and Rehabilitation will be held on Wednesday, March 26, 1952, at the Chicago Clinic of Physical Medicine, 6970 N. Clark St., Chicago, 8:00 p. m. Dinner will be served before the meeting at 6:30 p. m. Dr. Milton G. Schmitt will present the topic "Treatment of Backaches." Reservations should be made early with the Secretary of the Society, Dr. Milton G. Schmitt, 6970 N. Clark St., Chicago 26.

APPROVED SCHOOLS OF PHYSICAL THERAPY **

Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Medical Director and Technical Director	Entrance Requirements [1]	Duration of Course	Classes Begin	Maximum Enrolment	Tuition	Certificate, Diploma, Degree
Medical Department — U. S. Army							
(Address all inquiries to the Office of the Surgeon General, Department of the Army, Washington 25, D. C.)							
Medical Field Service School, Brooke Army Medical Center, San Antonio, Texas	Charles D. Shields, Lt. Col., M.C. Agnes P. Snyder, Major, WMSC	e	49 wks.	Mar.-Sept.	26	None	Certificate
Fitzsimons Army Hospital, Denver	H. B. Luscombe, Col., M.C.	Affiliated with Medical Field Service School					
	Olena M. Cole, Maj., WMSC						
Letterman Army Hospital, San Francisco, California	Raoul C. Psaki, Lt. Col., M.C.	Affiliated with the Medical Field Service School				•	
	Emma Harr, Maj., WMSC						
Walter Reed Army Hospital, Washington, D. C.	J. H. Kuttert, Lt. Col., M.C.	Affiliated with Medical Field Service School					
	Brunetta Kuehlthau, Maj., WMSC						
Nonfederal							
Childrens Hospital, Los Angeles*	S. S. Matthews, M.D.	a-b-d	14 mos.	Sept	14	$300	Cert. or Degree
	Mrs. Mary J. Dodge						
College of Medical Evangelists, Los Angeles*	F. B. Moor, M.D.	a-b-c	15 mos.	Sept	16	$300	Cert. or Degree
	R. Wm. Berdan						
University of Southern California, Los Angeles*	C. L. Lowman, M.D.	a-b-d	14 mo.	Sept	16	Univer.	Certificate
	Charlotte W. Anderson	f	4 yrs.	FebSept	6	Univer.	Cert. & Degree
University of California School of Medicine, San Francisco*	Lucile Eising, M.D.	d	12 mos.	Sept	16	$220[2]	Cert. or Degree
	Margery L. Wagner						
Stanford University, Stanford University, Calif.*	W. H. Northway, M.D.	a-d-e	12 mos.	Varies	29	$600	Certificate
	Lucille Daniels	f	4 yrs.	Sept	16	$220 qr.	Degree
University of Colorado Medical Center, Denver*	Harold Dinken, M.D.	a-b-d	12 mos.	Sept	12	$204[2]	Cert. or Degree
	Mary Lawrence						
Northwestern University Medical School, Chicago	E. D. W. Hauser, M.D.	a-b-d	12 mos.	Oct	16	$450	Certificate
	Gertrude Beard						
State University of Iowa College of Medicine, Iowa City*	W. D. Paul, M.D.	e	12 mos.	Sept	20	$200	Certificate
	Olive C. Farr						
University of Kansas Medical Center, Kansas City, Kan.*	D. L. Rose, M.D.	d	12 mos.	FebSept	3	$40[3]	Certificate
	Ruth G. Monteith	f	4 yrs.	FebSept	9	$40[3]	Degree
Simmons College, Boston	W. T. Green, M.D.	a-e	16 mos.	Sept	24	College	Diploma
	Shirley M. Cogland	f	4½ yrs.	Sept			Degree
Boston University College of Physical Education for Women, Sargent College, Cambridge, Mass.	Kenneth Christophe, M.D.	c-d-e-f	1-2-4 yrs.	Sept	30	Univer.	Cert. or Degree
	Adelaide J. McGarrett						
Bouve-Boston School in affiliation with Tufts College, Medford, Mass.	Howard Moore, M.D.	f	4 yrs.	Sept	16	$550	Dipl. & Degree
	Constance K. Greene						
University of Minnesota, Minneapolis*	F. J. Kottke, M.D.	e	2 yrs.	Sept	20	$126	Degree
	Ruby Green Overmann						
Mayo Clinic, Rochester, Minn.*	E. C. Elkins, M.D.	a-b-c	2 yrs.	Sept	38	$250	Certificate
	Harry Keown						
St. Louis University, Division of Health and Hospital Services, St. Louis*	A. J. Kotkis, M.D.	f	4 yrs.	JanSept	12	$175 Semes.	Degree
	Sister Mary Imelda						
Washington University School of Medicine, St. Louis*	Sedgwick Mead, M.D.	c	2 yrs.	Sept	16	$450 1st yr.[3]	Degree
	Beatrice F. Schulz					$325 2d yr.[3]	
Albany Hospital, Albany, N. Y.	J. W. Ghormley, M.D.	a-b-d	12 mos.	Sept	6	$300	Certificate
	Catharine Graham	f	4 yrs.	Sept		$600	Degree
Columbia University College of Physicians and Surgeons, New York City*	W. B. Snow, M.D.	a-c-e	1-2 yrs.	Sept	50	$680 (1 yr.) $1,200 (2 yrs.)	Cert. or Degree
	Floy L. Pinkerton						
New York University School of Education, New York City*	G. G. Deaver, M.D.	a (+1 yr. coll.) b-d	12 mos.	Sept	40	$615	Cert. & Degree
	Elizabeth C. Addoms						
Duke University, Durham, N. C.*	L. D. Baker, M.D.	a-b-d	15 mos.	Oct	12	$350	Certificate
	Helen Kaiser						
Cleveland Clinic Hospital, Cleveland*	Walter J. Zeiter, M.D.	a-b-c	12 mos.	Oct	12	$200	Diploma
	Mildred Heap						
D. T. Watson School of Physical Therapy, Leetsdale, Pa.*	Jessie Wright, M.D.	a-b-d	12 mos.	Oct	25	$300	Diploma
	Kathryn Kelley						
Division of Physical Therapy of the School of Auxiliary Medical Services of the University of Pennsylvania, Philadelphia*	G. M. Piersol, M.D.	e	12 mos.	FebSept	32	$600	Certificate
	Dorothy E. Baethke	f	4 yrs.	Sept	40	$600	Cert. & Degree
University of Texas School of Medicine, Galveston*	G. W. N. Eggers, M.D.	a-b-d	12 mos.	Jan	8	$149[2]	Cert. or Degree
	Ruby Decker						
Hermann Hospital, Houston, Texas*	O. O. Selke, Jr., M.D.	a-b-d	12 mos.	Oct	15	$300	Certificate
	Mary Elizabeth Kolb						
Baruch Center of Physical Medicine and Rehabilitation, Medical College of Virginia, Richmond*	W. J. Lee, M.D.	a-b-d	12 mos.	Sept	52	$300[2]	Diploma
	Susanne Hirt	f	4 yrs.	Sept			Degree
University of Wisconsin Medical School, Madison*	H. D. Bouman, M.D.	a-b-d	14 mos.	Sept	22	$60	Certificate
	Margaret A. Kohli		4 yrs.	FebSept	20	Semes.[3]	Cert. & Degree

** Reprinted in part J. A. M. A. 146:197 (May 12) 1951.

1. Courses are so arranged that any of the entrance requirements will qualify students for training. a = Graduation from accredited school of nursing; b = Graduation from accredited school of physical education; c = Two years of college with science courses; d = Three years of college with science courses; e = Four years of college with science courses; f = High school graduation.

2. Nonresidents charged additional fee.

3. Male as well as female students admitted.

4. Effective July 1, 1952, tuition will be $262.50 for each of the first three semesters, and $112.50 for the fourth semester, making a total of $900.00 for two years.

APPROVED SCHOOLS OF OCCUPATIONAL THERAPY **

Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Director and Medical Director	Entrance Requirements	Duration of Course[1]	Classes Begin	Graduates in 1950	Tuition per Year	Certificate, Diploma, Degree
University of Southern California, Los Angeles*	Margaret S. Rood	Degree	18 mos.	Varies	12	$594	Certificate
	J. B. Armstrong, M.D.	High sch.	5 yrs.	Varies	19	$540	Cert. & Deg.
Mills College, Oakland, Calif.	Elsa H. Hill	Degree	2½ yrs.	FebSept	2	$250	Certificate
	S. M. Dorimson, M.D.	High sch.	5 yrs.	FebSept	4	$650	Cert. & Deg.
San Jose State College, San Jose, Calif.*	Mary D. Booth	Degree	18 mos.	Varies	1	$ 28.50	Certificate
	Charles Ianne, M.D.	High sch.	45 mos.	Varies	13	$ 28.50	Cert. & Deg.
University of Illinois College of Medicine, Chicago*	Beatrice D. Wade	High sch.	5 yrs.	MarSept	13	$110	Degree
	S. W. Olson, M.D.						
State University of Iowa, Iowa City*	Marguerite McDonald		19 mos.	FebSept	2	$144[2]	Certificate
	W. D. Paul, M.D.	High sch.	46 mos.	FebSept	5	$144[2]	Cert. & Deg.
University of Kansas, Lawrence	Nancie B. Greenman	High sch.	45 mos.	FebSept	16	$135[2]	Degree
	D. L. Rose, M.D.						
Boston School of Occupational Therapy, 7 Harcourt St., Boston*	Marjorie B. Greene	Degree	2 yrs.	Sept	13	$500	Diploma
	A. W. Reggio, M.D.	High sch.	5 yrs.	Sept	21	$500	Degree
Wayne University, Detroit*	Barbara Jewett	Degree	19 mos.	Varies	1	$150	Certificate
	F. A. Weiser, M.D.	High sch.	46 mos.	Varies	2	$150	Degree
Kalamazoo School of Occupational Therapy, Kalamazoo, Mich.*	Marion R. Spear	Degree	18 mos.	FebSept	3	$ 75[2]	Diploma
Michigan State Normal College, Ypsilanti, Mich.*	R. B. Burrell, M.D.	1 yr. coll.	4 yrs.	FebSept	23	$ 75[2]	Dipl. & Deg.
	Frances Herrick	High sch.	5 yrs.	FebSept	6	$ 67.50[2]	Cert. & Deg.
	V. L. VanDuzen, M.D.						
University of Minnesota, Minneapolis*	Borghild Hansen	High sch.	40 mos.	Sept	12	$126[2]	Degree
	F. J. Kottke, M.D.						
College of St. Catherine, 2004 Randolph, St. Paul	Sister Jeanne Marie	High sch.	4½ yrs.	Varies	24	$225	Degree
	J. M. Ryan, M.D.						
Washington University School of Medicine, St. Louis*	Erna L. Rozmarynowski	Degree	11-14 mos.	Sept	—	{ Univer-	Certificate
	R. A. Moore, M.D.	2 yrs. coll.	28 mos.	Sept	14	} sity	Degree
University of New Hampshire, Durham*	Esther Drew	High sch.	5 yrs.	Sept	8	$206[2]	Cert. & Deg.
	J. A. MacDonald						
Columbia University College of Physicians and Surgeons, New York City*	Marjorie Fish	Degree	17 mos.	Sept	20	$600	Certificate
	W. B. Snow, M.D.	2 yrs. coll.	27 mos.	Sept	10	$600	Degree
New York University School of Education, New York City*	Frieda J. Behlen	1 yr. coll.		FebSept	3	$500	Certificate
	John Sawhill, M.D.	High sch.	4½ yrs.	FebSept	26	$500	Cert. & Deg.
Ohio State University, Columbus*	Martha E. Jackson	High sch.	4 yrs.	Varies	16	$ 90[2]	Degree
	R. H. Jacques, M.D.						
Philadelphia School of Occupational Therapy of the School of Auxiliary Medical Services of the University of Pennsylvania, Philadelphia*	Helen S. Willard	Degree	18 mos.	Sept	21	$600	Certificate
	J. C. Yaskin, M.D.	High sch.	5 yrs.	Sept	1	$600	Degree
Texas State College for Women, Denton	Fanny B. Vanderkooi	Degree	18 mos.	FebSept	—	———	Certificate
	O. T. Woods, M.D.	High sch.	5 yrs.	FebSept	5	$ 50	Degree
Richmond Professional Institute, 901 W. Franklin St., Richmond, Va.*	H. Elizabeth Messick	High sch.	4 yrs.	Sept	5	$200	Degree
	I. E. Barrett, M.D.	Degree	10-18 mos.	FebSept	4	$182 +	Certificate
College of Puget Sound, 18th and Warner Sts., Tacoma, Wash.*	Edna-Ellen Bell		2 yrs.	FebSept	—	$400	Certificate
	A. J. Hermann, M.D.	High sch.	5 yrs.	FebSept	5	$250	Cert. & Deg.
University of Wisconsin, Madison*	Caroline G. Thompson	High sch.	5 yrs.	Sept	12	$120[2]	Cert. & Deg.
	H. D. Bouman, M.D.				—		
Milwaukee-Downer College, Dept. of Occupational Therapy, 2512 E. Hartford Ave., Milwaukee	Henrietta W. McNary	2 yrs. coll.	3 yrs.	Sept	2	$350	Diploma
	M. C. Borman, M.D.	High sch.	5 yrs.	Sept	20	$350	Dipl. & Deg.
Mount Mary College, 92d and Burleigh, Milwaukee	Sister Mary Arthur	High sch.	5 yrs.	Sept	14	$260	Cert. & Deg.
	J. C. Griffith, M.D.				—		

** Reprinted J. A. M. A. 146:198 (May 12) 1951.

1. Duration of course is expressed in academic years or in number of months.

2. Nonresidents charged additional fee.

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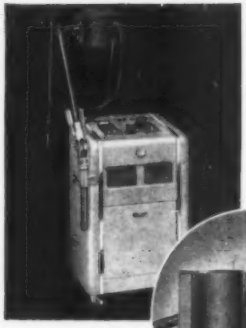

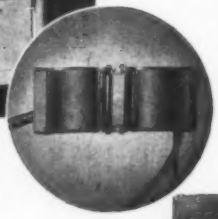

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BAY STATE REHABILITATION CONFERENCE

Wednesday, March 12, 1952
Copley Plaza Hotel
Boston

THE PROGRAM

9:30-10:30 Registration.

10:30-12:15 "Manpower and Rehabilitation"
A discussion of what can be done to encourage employment of the handicapped. Harry E. Howard, Manager of Personnel at the Norton Company, Worcester, will be Chairman. Panel members will include Phyllis L. Bartelme, Ph.D., Psychological Consultant for the National Society for Crippled Children and Adults, Inc.; William E. Durnan, Manufacturing Manager, Bijur Lubricating Company, Rochelle Park, New Jersey; Earl S. Miers, Author, Editor, Miers Publications, Metuchen, New Jersey; Mary E. Switzer, Director, United States Office of Vocational Rehabilitation, Washington, D. C.; Henry Viscardi, Jr., Executive Director, Just One Break for the Disabled Committee, Institute of Physical Medicine and Rehabilitation, New York.

12:45- 2:45 Easter Seal Luncheon and Dramatized Presentation of Rehabilitation
(Chief narrator to be announced)

3:00- 5:00 "Helping Them to Help Themselves"
A clinical demonstration to be introduced by Joseph S. Barr, M.D., Chief of Orthopedic Service, Massachusetts General Hospital. Cases will be presented and discussed by Henry H. Kessler, M.D. Medical Director, Kessler Institute, West Orange, New Jersey; Elmer E. Franseen, M.D., Medical Director, Bay State Treatment-Training Center, Springfield; Robert C. Hartson, M.D.,; Medical Director, Curative Workshop, Worcester; William E. Kenney, M.D., Medical Director, Bay State Training Center of the Truesdale Hospital, Fall River; Arthur L. Watkins, M.D., Medical Director, Bay State Medical Rehabilitation Clinic, Boston.

All those interested in rehabilitation are cordially invited to attend.

There is no registration fee and all sessions are open to the public.

For further information, write:

BAY STATE SOCIETY FOR THE CRIPPLED AND HANDICAPPED, INC.
3 Joy Street
Boston 8, Massachusetts

MEETINGS OF INTEREST TO THOSE IN THE FIELD OF PHYSICAL MEDICINE AND REHABILITATION

In this column will be published information about meetings of interest to those in the field of physical medicine New data should be sent promptly to the office of the ARCHIVES, 30 North Michigan Avenue, Chicago 2, Illinois.

American Congress of Physical Medicine. — 30th Annual Session, The Roosevelt, New York, New York, August 25, 26, 27, 28, 29, 1952. Walter J. Zeiter, M.D., Chairman, Convention Committee, 30 North Michigan Ave., Chicago 2.

Section on Physical Medicine and Rehabilitation of the American Medical Association. — Tuesday, Wednesday and Thursday morning of the A. M. A. meeting (June 10, 11 and 12, 1952) in Chicago. Secretary, Walter J. Zeiter, M.D., Cleveland Clinic Foundation, 2020 East 93rd St., Cleveland 6, Ohio.

Chicago Society of Physical Medicine and Rehabilitation. — Meetings, fourth Wedesnday, January through May, 1952. Milton G. Schmitt, M.D., Secretary, 6970 N. Clark Street, Chicago 26.

New York Society of Physical Medicine. — Meetings, first Wednesday. Madge C. L. McGuinness, M.D., Secretary, 48 E. 62nd St., New York 21, N. Y.

Latin-American Congress of Physical Medicine. — Fourth Congress of Physicians in the Latin countries and the United States interested in Physical Medicine, Panama City, R. P., February 24-29, 1952. Executive Director, Cassius Lopez de Victoria, M.D., 176 East 71st Street, New York 21, N. Y.

The National Society for Crippled Children and Adults, Inc. — 1952 annual convention, Fairmont Hotel, San Francisco, October 26, 27, 28 and 29, 1952. Lawrence J. Linck, Executive Director, 11 South La Salle Street, Chicago 3.

American Occupational Therapy Association. — Annual Convention, August 9-16, 1952, Milwaukee, Wisconsin, Hotel Schroeder. Marjorie Fish, OTR, Executive Director, 33 West 42nd Street, New York 18, N. Y.

American Physical Therapy Association. — Philadelphia, Pennsylvania, Bellevue-Stratford Hotel, June 23,-28, 1952. Mildred Elson, Executive Director, 1790 Broadway, New York 19, N. Y.

International

International Congress of Physical Medicine (1952). London, July 14 to 19, 1952. Applications for the provisional program should be addressed to the Honorary Secretary, Dr. A. C. Boyle, International Congress of Physical Medicine (1952) 45, Lincoln's Inn Fields, London, W.C. 2.

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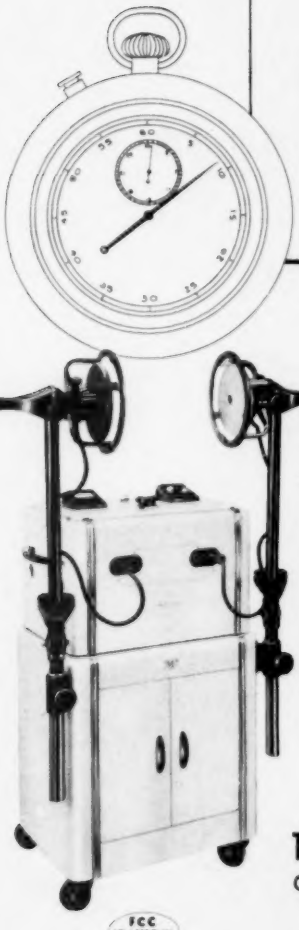

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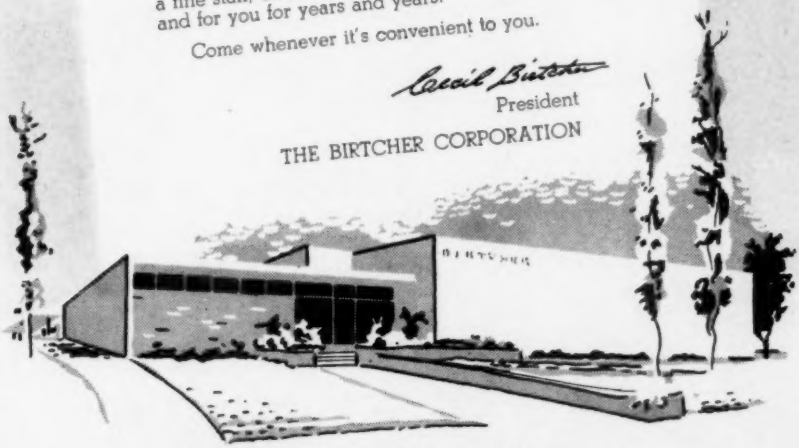

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